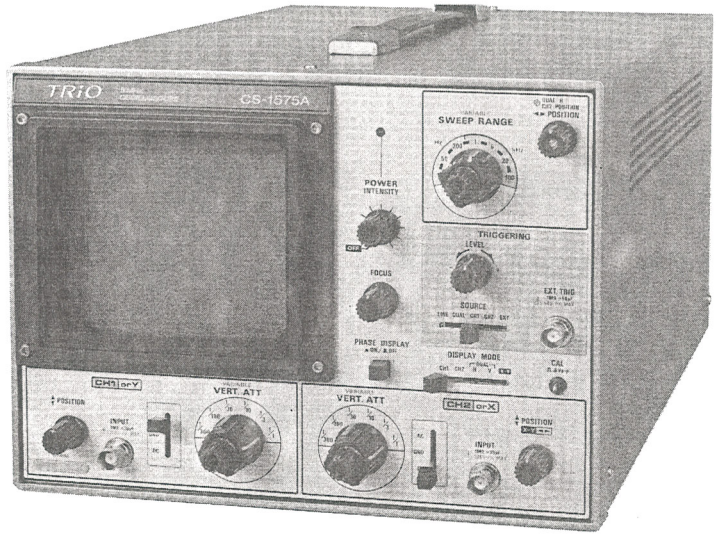
CS-1575A

(DUAL TRACE OSCILLOSCOPE)



TRIO

SPECIFICATIONS

CATHODE RAY TUBE

Type :	130BEB31
Acceleration voltage :	2 kV
Useful measuring :	8 divx10 div (1 div = 1 cm)

VERTICAL AXIS (for both CH1 and CH2)

Sensitivity :	10 mV/div or higher
Attenuator :	1-3 steps, 1/1 to 1/300, 6 ranges, precisely adjustable between ranges. Inter-channel error is ±5%.
Input impedance :	1 MΩ±3% Approx. 30 pF
Frequency response :	
DC :	DC to 5 MHz (−3 dB), DC to 7 MHz (−6 dB)
AC :	5 Hz to 5 MHz (−3 dB), 5 Hz to 7 MHz (−6 dB)
Risetime :	70 nsec
Crosstalk :	Less than −40 dB (at 1 kHz)
Operating mode :	
CH1 :	Channel 1 only, single trace
CH2 :	Channel 2 only, single trace
DUAL-H :	Horizontal dual trace
DUAL-V :	Vertical dual trace
X-Y :	CH1 = Y axis, CH2 = X axis
Dual-trace selection :	Automatic selection of CHOP and ALT (Switched to CHOP at about 80 kHz when SWEEP RANGE is set to 10 -50 Hz and TRIG.SOURCE is in LINE, CH1, CH2 or EXT. Switched to ALT at other settings.)
Phase indication :	X and Y are simultaneously displayed by PHASE DISPLAY. Zero phase Lissajous' figure is displayed at the same time during X-Y operation.
⚠ Maximum input voltage :	600 Vp-p or 300 V (DC + AC peak)

SWEEP

Sweep system :	Auto free-run sweep (free-run sweep at no-signal)
Sweep frequency :	10 Hz-50 Hz, 50 Hz-200 Hz, 200 Hz-1 kHz, 1 kHz-5 kHz, 5 kHz-20 kHz and 20 kHz-100 kHz Fine adjustment in 6 ranges.
Linearity :	Less than 5%

TRIGGERING

Source :	
LINE :	Fixed to supply frequency.
DUAL :	Source is automatically selected to the waveform of CH1 or CH2
CH1 :	Fixed to CH1 signal.
CH2 :	Fixed to CH2 signal.
EXT :	Fixed to external signal.
Triggering level :	Set by the TRIG.LEVEL switch.
Slope :	Positive only
Coupling :	AC only (inclusive of EXT)
External triggering :	
Input impedance :	Approx. 1 MΩ, approx. 50 pF
⚠ Maximum input voltage :	100 Vp-p or 50 V (DC + AC peak)
Triggering range :	
Internal (DUAL, CH1, CH2) :	0.5 div (50 Hz-3 MHz) 1 div (20 Hz-5 MHz)
External (EXT) :	0.5 Vp-p (50 Hz-3 MHz) 1 Vp-p (20 Hz-5 MHz)

HORIZONTAL AXIS (CH2)

Operating mode :	X-Y mode is selected by DISPLAY MODE switch. CH1: Y axis, CH2: X axis
Sensitivity :	Same as vertical axis (CH1)
Input impedance :	Same as vertical axis (CH1)
Frequency response :	
DC :	DC to 1 MHz (−3 dB), DC to 1.5 MHz (−6 dB)
AC :	5 Hz to 1 MHz (−3 dB), 5 Hz to 1.5 MHz (−6 dB)
X-Y phase difference :	Less than 3° at 50 kHz
X-Y distortionless amplitude :	More than 8 div × 8 div at 100 kHz (POSITION: Center)

CALIBRATION VOLTAGE :

0.6 Vp-p ±5%
Positive square wave of power supply frequency

POWER SUPPLY

Power supply voltage :	AC 100/120/220/240 V ±10%, 50/60 Hz
Power consumption :	Approx. 25 W

DIMENSIONS

Width :	260 mm (260 mm)
Height :	190 mm (214 mm)
Depth :	375 mm (440 mm)
	Figures in ( ) show maximum size.

WEIGHT : 8 kg

ACCESSORIES :

BNC cord :	2
AC cord :	1
Instruction manual :	1
Replacement fuse :	0.3A 2 0.7A 2

OPTIONAL ACCESSORIES :

PC-20 (attenuator probe)

Attenuation :	1/10, 1/1
Input impedance :	10 MΩ, less than 18 pF (1/10) 1 MΩ, less than 100 pF (1/1)

SPECIFICATIONS

CRT 130BEB 31 SPECIFICATIONS

Screen and Shape

Dimensions;	
Overall length;	365 ± 10 mm
Face plate dimensions;	133 ± 3 mm
Screen shape;	Round and flat face
Deflection and focusing system;	Electrostatic deflection, electrostatic focusing
Color;	Green
Persistence;	Medium short
Useful display area;	Y axis.....80 mm X axis.....100 mm

Heating

Heater voltage;	6.3 V
Heater current;	0.3 A

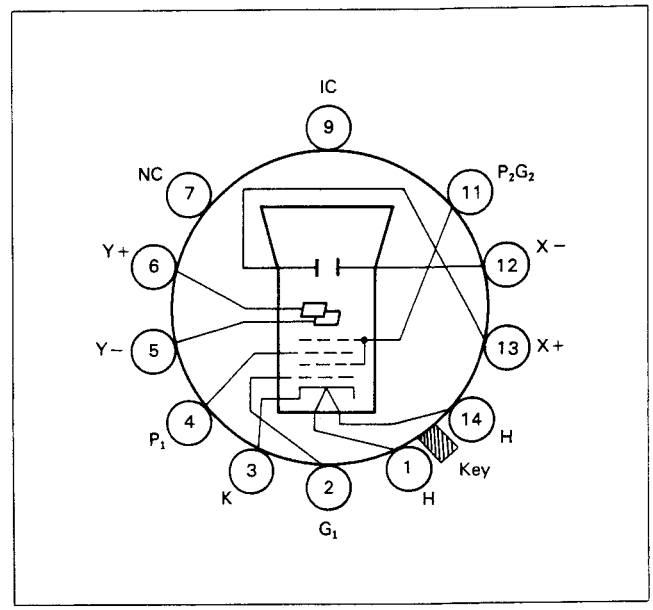


Fig. 1 130BEB31 Basing

SAFETY

SAFETY

Before connecting the instrument to a power source, carefully read the following information, then verify that the proper power cord is used and the proper line fuse is installed for power source. The specified voltage is shown on the rear panel. If the power cord is not applied for specified voltage, there is always a certain amount of danger from electric shock.

Line voltage

This instrument operates using ac-power input voltages that 100/120/220/240 V at frequencies from 50 Hz to 60 Hz.

Power cord

The ground wire of the 3-wire ac power plug places the chassis and housing of the oscilloscope at earth ground. Do not attempt to defeat the ground wire connection or float the oscilloscope; to do so may pose a great safety hazard. The appropriate power cord is supplied by an option that is specified when the instrument is ordered.
The optional power cords are shown as follows in Fig. 2.

Line fuse

The fuse holder is located on the rear panel and contains the line fuse. Verify that the proper fuse is installed by replacing the line fuse.

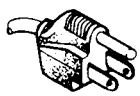
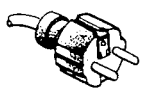
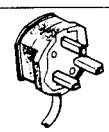
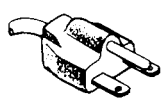
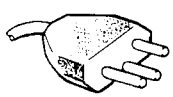
Plug configuration	Power cord and plug type	Factory installed instrument fuse	Line cord plug fuse	Parts No. for power cord
	North American 120 volt/60 Hz Rated 15 amp (12 amp max; NEC)	0.7 A, 250 V Fast blow AGC/3AG	None	E30-1820-05
	Universal Europe 220 volt/50 Hz Rated 16 amp	0.3 A, 250 V Fast blow 5×20 mm	None	E30-1819-05
	U.K. 240 volt/50 Hz Rated 13 amp	0.3 A, 250 V Fast blow 5×20 mm	0.3 A Type C	—
	Australian 240 volt/50 Hz Rated 10 amp	0.3 A, 250 V Fast blow 5×20 mm	None	E30-1821-05
	North American 240 volt/60 Hz Rated 15 amp (12 amp max; NEC)	0.3 A, 250 V Fast blow AGC/3AG	None	—
	Switzerland 240 volt/50 Hz Rated 10 amp	0.3 A, 250 V Fast blow AGC/3AG 5×20 mm	None	—

Fig. 2 Power Input Voltage Configuration

CIRCUIT DESCRIPTION

VERTICAL AMPLIFIER CIRCUIT

Note: Parts symbols in ( ) are for CH2.

The vertical amplifier circuit has two identical preamplifiers for CH1 and CH2.

A signal applied to the BNC INPUT terminal passes through the AC-GND-DC switch and is fed to the 1st attenuator where the signal is attenuated to 1/1, 1/10 or 1/100 so as to be inputted to the gate of Q2 (Q12).

Q2 (Q12) is a dual FET which has excellent DC balance against changes in temperatures and also has a high input impedance.

Q1 (Q11) is an input protection circuit utilizing the excellent diode characteristics of FET, which is used to protect Q2 (Q12) from excessive input. The source circuit of Q2 (Q12) has VR8 (VR18) to adjust VARI. ATT and DC. BALANCE.

The signal from Q2 (Q12) is fed through the emitter follower Q3 and Q4 (Q13 and Q14) to the 2nd attenuator Q5 and Q6 (Q15 and Q16).

The collector of Q5 and Q6 (Q15 and Q16) forms an attenuator to attenuate the signal to 1/1 or 1/3, while VR3 (VR13) is used to adjust STEP ATT and DC. BALANCE. VR2 (VR12) in the emitter circuit of these transistors is used to adjust the gain (VARIABLE ATT). The gain is calibrated by VR1 (VR11).

The signal from the 2nd attenuator is fed to the preamplifier Q7 and Q8 (Q17 and Q18). VR5 (VR15) in the emitter circuit of these transistors is the ▲▼ POSITION control and VR4 (VR14) is the ADJUST control.

The signal from the preamplifier is fed to the vertical mode logic circuit consisting of diode gate (D3 ~ D10) inserted to the cascode amplifier Q9 (Q19), Q10 (Q20), Q21 and Q22 and the cascode junction, in which the signal is switched to a dual trace signal and is fed to the vertical main amplifier Q25 ~ Q28 through the drive amplifier Q23 and Q24 where the center position of CRT is adjusted by VR6 inserted in the emitter circuit of Q25 and Q26 to prevent the dynamic range of the output of Q21 and Q22 from being biased.

The signal from the preamplifier is sampled and is fed through Q9 and Q10 (Q19 and Q20) to the trigger amplifier Q29 and Q30 (Q31 and Q32), which is further fed to sync circuit. The gain of the "X" amplifier is calibrated by VR17 while the X-POSITION is adjusted by VR16.

The signal is then amplified through the vertical main amplifier to provide sufficient bandwidth so as to be applied to the vertical deflection plate of CRT.

SYNC SWEEP CIRCUIT

The signal from the vertical preamplifier is fed through the trigger amplifier to the limiter circuit Q2 and Q3 (Q4 and Q5) where the trigger level is adjusted by VR1. The CH2 limiter circuit Q4 and Q5 also functions as a limiter circuit for external triggering; line signal and an external trigger signal which pass through the external trigger amplifier Q21 and a CH2 trigger signal are selected by the trigger source switch and is applied to the base of Q5.

The trigger signal from the limiter circuit is shaped to square wave signal through the Schmidt circuit "A" (A') IC2a and b (IC2c and d) and is fed to the mono multi-circuit IC3a and b (IC3c and d).

The mono multi-circuit is controlled through Q6 (Q7) by the auto-free-run circuit D3 and D4 (D5 and D6) which DC restores the output of the Schmidt circuit "A" (A'), and the trigger mode logic circuit IC1a, b and d, to produce negative pulses of about 40 nsec only at the falling time of the output of the Schmidt circuit "A" (A'). These pulses are attenuated to 1/2 by R27 and R33. Since the negative pulse is in the middle of the threshold level of the Schmidt circuit "B" IC4c and d, it inverts the output of this circuit from "H (1)" to "0". The circuits IC4a-d, Q8-Q11 and D13-D16 form one loop to constitute a saw-tooth wave generating circuit.

At first, the output of the Schmidt circuit "B" is "H (or 1)", so D14 ~ D16 are ON and, hence, the output of the mirror integration circuit is almost 0 V. This voltage is fed through the emitter follower Q8 and Q9 to the Schmidt circuit "C" IC4a and b, the output of which becomes "L (0)" and, therefore, D13 is set to "ON".

If, at this time, a negative pulse is fed by the mono multicircuit, the outpuf of the Schmidt circuit "B" becomes "L (0)" which turns D14 ~ D16 to OFF and thus the time base capacitor C21 starts charging through the mirror integration circuit.

The charge current is determined by the voltage set by VR2 (SWEEP VARI) while R44, 73, 45 and 46 are selected by the SWEEP RANGE control; the charge current is applied through the emitter follower Q22.

The charge voltage from the integration circuit is fed to the Schmidt circuit "C" via R76 and R90, Q8 and Q9 and when it reaches the threshold level, then the Schmidt circuit "B" is driven where the output is inverted from "L (0)" to "H (1)" and at the same time D13 is turned to OFF. When the output of the Schmidt circuit becomes H (1), D15 and D16 turn to ON and the integration circuit is discharged quickly until D14 turns to ON.

Also, the voltage charged in the hold-off capacitor C18 through Q8 is discharged slowly through R42 because D13 is OFF; this voltage is fed through Q9 to the Schmidt circuit "C" where the output is inverted and D13 turns to ON, thereby returning to the original condition.

CIRCUIT DESCRIPTION

HORIZONTAL AMPLIFIER CIRCUIT

The output of the mirror integration circuit Q10 and Q11 is fed to the emitter of Q14 through VR4 (WIDTH ADJUST), VR104 (POSITION) and VR5 (◄► POSITION ADJUST). Q14 and Q15 are cascode connected; the collector of Q15 is connected to the collector of Q16 which is also cascode connected to Q32 of the vertical axis to supply X axis signal during X-Y operation. These two cascode amplifiers are switched by IC7 through D11 and D12 to feed saw-tooth wave signal (SWEEP) or X axis signal (X-Y) to the "H" (horizontal) amplifier Q17-Q20, and the signal thus amplified is directly connected to the horizontal deflection plate of CRT.

DISPLAY MODE CIRCUIT

The output of the Schmidt circuit "B" is inverted by IC5d and is NAND connected through IC5c to the output of the CHOP signal generator IC5a and b to produce UN-BLANKING signal. This signal passes through VR101 (IN-TENSITY) and is fed to the BLANKING amplifier and, at the same time, it is inverted by IC1c to produce clock signal to IC6. Therefore, IC6 generates gate signal which switches CH1 and CH2 of vertical axis at each sweep or each cycle of CHOP signal.

PHASE DISPLAY CIRCUIT

When the PHASE DISPLAY is OFF in DUAL mode, IC6 generates a gate signal with selects CH1 and CH2 alter-nately.

When the PHASE DISPLAY is ON, the 3-dividing circuit consisting of IC6 and IC7 displays CH1, CH2 and X-Y in turn.

When the PHASE DISPLAY is ON in X-Y mode, the display shows X-Y and 0-phase Lissajous' waveform alternately due to the output of IC6.

DUAL-H MODE CIRCUIT

When DISPLAY MODE is DUAL-H, Q12 is OFF, so the peak value of saw-tooth wave from the integration circuit is reduced to 1/2 of that in the other state. This saw-tooth wave signal is fed to the input of the horizontal amplifier circuit but the base input of Q18 of this amplifier is given from Q13.

Q13 is normally OFF and, hence, the base voltage of Q18 is 5 V. In DUAL-H mode, the emitter of Q13 is earthed through D22 and the emitter of Q13 is supplied with the output signal from IC6 and IC7, which is AND coupled through D9 and D10.

Therefore, the emitter of Q13 is earthed through D22 only when IC6 is in CH2 mode and IC7 is in sweep mode and thus the output signal from IC6 and IC7, which is AND coupled through D9 and D10, is applied to the base. Accordingly, Q13 is ON only when IC6 is in CH2 mode and IC7 is in sweep mode. At this time, the collector voltage is inputted to the base of Q18 through VR105 (DUAL-H CH2 ◄► POSITION).

With these signals applied, the horizontal main amplifier outputs two saw-tooth wave signals, each having a dif-ferent DC component, which are synchronized with the output of IC6, thereby displaying CH1 signal on the left half and CH2 signal on the right half sections of CRT.

BLANKING CIRCUIT

The unblanking signal from IC5c passes through VR101 (INTENSITY) and is fed to the unblanking amplifier Q45 ~ Q47. Q45 and Q46 are cascode connected and its output is fed back to the base of Q45 through the current regulated emitter follower D47 and Q47 and, at the same time, it amplitude modulates the output of Q48 through D50 and D49. The output of the amplifier composed of Q48 and D48 is determined by the frequency of the DC-DC converter. The anode of D49 is connected to VR23 (IN-TENSITY ADJ.) to adjust the blanking position of INTENSI-TY.

The amplitude modulated signal is DC-restored by D51 and D52, which is applied to the grid of CRT to produce a trace during sweep operation.

CRT POWER CIRCUIT

The CRT ASTIG electrode voltage from VR22 (ASTIG) is fully stabilized through the emitter follower Q52.

In the high voltage circuit, D54, Q51, T1 form a DC-DC converter circuit; the output from T1 secondary is rectified by D41 and is connected to the cathode of CRT and, at the same time, it is fed back to the regulation circuit Q49 and Q50 while feeding FOCUS electrode voltage to CRT via VR102 (FOCUS). The output voltage is adjusted by VR21 (−1.9 kV ADJ.).

POWER CIRCUIT

Power voltage required to drive the oscilloscope circuits is stabilized by the tracking regulator IC1a and b, IC2a and b, Q41 ~ Q44, and is supplied through D44 ~ D46 and VR24 (+180 V ADJ.).

CALIBRATING VOLTAGE CIRCUIT

The oscilloscope calibrating voltage utilizes 0.6 Vp-p square wave obtained by switching Q1 with power fre-quency.

CIRCUIT DESCRIPTION

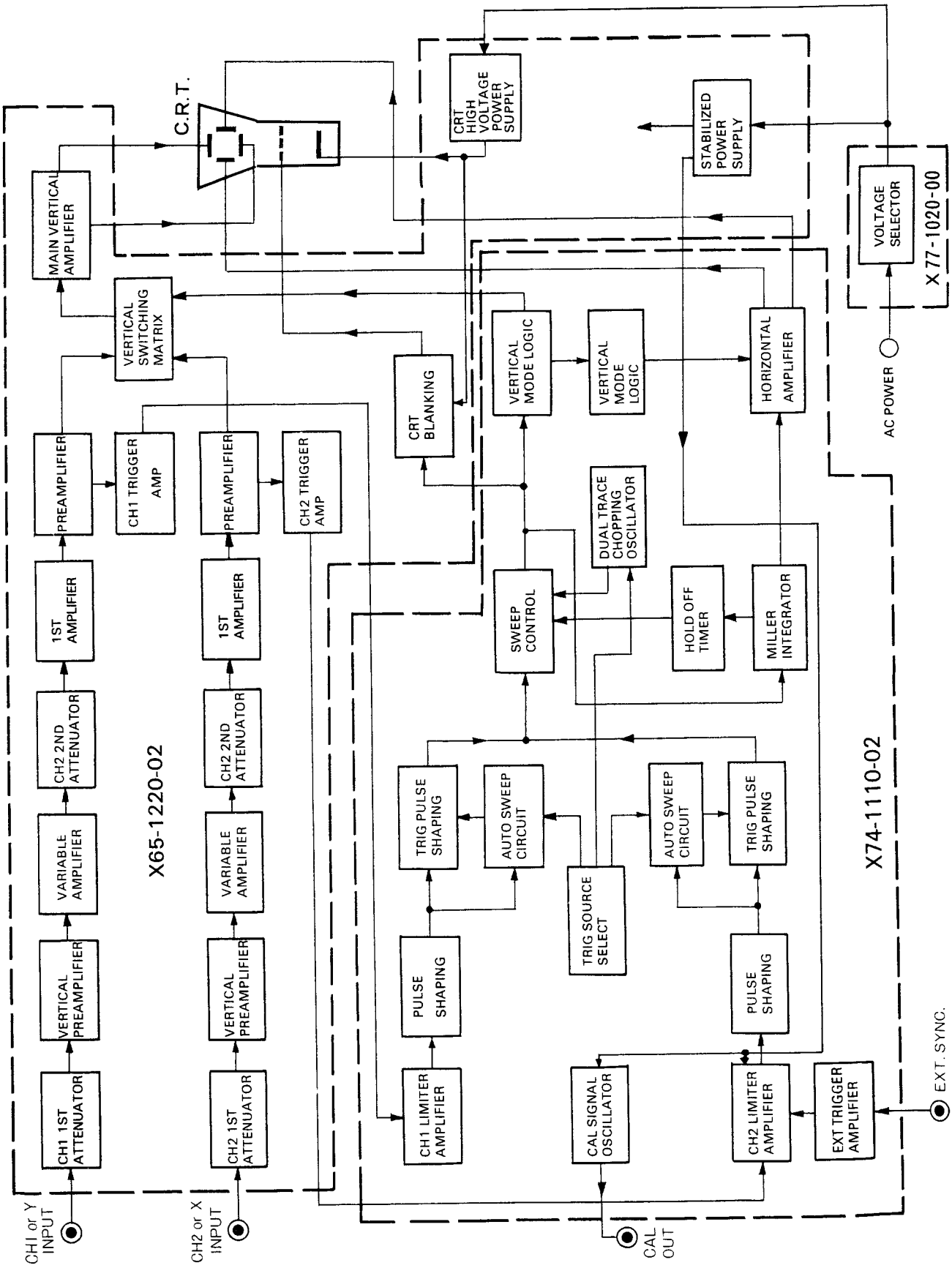


Fig. 3 BLOCK DIAGRAM

ADJUSTMENT

To obtain the best performance, periodically calibrate the unit. Sometimes, only one mode need be calibrated, while at other times, all modes should be calibrated. When one mode is calibrated, it must be noted that the other modes may be affected. When calibrating all modes, perform the calibration in the specified sequence.
The following calibration required an accurate measuring instrument and an insulated adjusting flat blade screwdriver. If they are not available, contact your dealer.
For optimum adjustment, turn the power on and warm up the scope sufficiently (more than 30 minutes) before starting.
Before calibrating the scope, check the power supply voltage.

TEST EQUIPMENT REQUIRED

The following instrument or their equivalent should be used for making adjustment.

Test Equipment	Model	Minimum Specification
Digital Multi-Meter	DL-706 (TRIO)	Impedance: More than 10 MΩ, Measuring range: 0.01 V to 199 V
Sine-Wave Generator	651 B (YHP)	Frequency: 10 Hz to 10 MHz, constant voltage over tuning range
Sine-Wave Generator	SG-503 (Tektronix)	Frequency: 50 kHz to 100 MHz, Output impedance: 50 Ω, constant voltage over tuning range.
Square-Wave Generator	PG-506 (Tektronix)	Output signal: 1 kHz, Amplitude: 10 mVp-p to 10 Vp-p, Accuracy: within ±1%, Rise time: 35ns or less 100 kHz, Rise time: 1 ns or less
Q Meter	4343B (YHP)	—
Color Pattern Generator	CG-911A (TRIO)	—
Oscilloscope	CS-2110 (TRIO)	Sensitivity: more than 5 mV Frequency response: More than 100 MHz
Time-Marker Generator	TG-501 (Tektronix)	Time mark: 0.5 s to 0.1μs repetitive waveform
High-Voltage Probe	—	Input Impedance: 1000 MΩ
Termination	—	Impedance: 50 Ω Accuracy: within 3%
Termination	—	3 watts type impedance: 50 Ω
Attenuator	—	−20 dB attenuation (50 Ω)

Table 1

PREPARATION FOR ADJUSTMENT

Control Setting

The control setting listed below must be used for each adjustment procedure.
Exceptions to these settings will be noted as they occur.
After completing a adjustment, return the controls to the following settings.

NAME OF KNOBS	POSITION
INTENSITY	3 o'clock
FOCUS, ASTIG	Optimum position
CH1, CH2 ▲▼ POSITION	Mechanical center
◄► POSITION	Mechanical center, push
VARIABLE (VOLTS/DIV, SWEEP RANGE)	CAL
AC-GND-DC (CH1 and CH2)	DC (GND at no signal)
PHASE DISPLAY	OFF (▟)
DISPLAY MODE	CH1
SOURCE	DUAL
TRIG. LEVEL	Mechanical center
TRIG. MODE	AUTO
VERT ATT (CH1 and CH2)	1/1
SWEEP RANGE	2 ~ 1 kHz

Table 2

POWER SUPPLY AND CRT ADJUSTMENT

Reference Voltage (+180 V) adjustment

(1) Connect a dc voltmeter to measure the voltage at P13 pin 1 with respect to the chassis.
(2) Adjust VR24 for 180V±1% reading on the meter.
(3) Connect a dc voltmeter to measure the voltage at P13 pin 4, 5, 6 with respect to chassis and check the voltage as shown in table 3.

Pin No.	4	5	6
Voltage	+10V±0.5V	−10V±0.5V	+5V±0.25V

Table 3

(4) Connect a high impedance, high voltage dc voltmeter to masure the voltage at P11 pin 2 or 3 using a high voltage probe.
(5) Adjust VR21 for 1.9kV ±0.019kV reading on the meter.

ASTIG and FOCUS adjustment

(1) Select the DISPLAY MODE switch to X-Y position and together channel 1 and channel 2 AC-GND-DC switches to GND positions.
(2) Adjust the FOCUS control and VR22 (ASTIGmatism) for the sharpest, roundest spot.

ADJUSTMENT

Intensity adjustment

(1) Select the DISPLAY MODE switch to X-Y position and together channel 1 and channel 2 AC-GND-DC switches to GND positions.
(2) Adjust VR23 so the spot just disappears at 11 o'clock position of INTENSITY control.

CRT Centering adjustment

(1) Select the DISPLAY MODE switch to CH1 position.
(2) Short together TP1 and TP2 test points.
(3) Adjust VR6 to vertically center trace on the crt.

Blanking adjustment

(1) Select the channel 1 AC-GND-DC switch to GND position and SWEEP RANGE to 50 ~ 100kHz position.
(2) Adjust TC11 so that the brightness begins as near the start of the trace as possible.

VERTICAL AXIS ADJUSTMENT

Channel 1 DC Balance adjustment

(1) Select the channel 1 AC-GND-DC switch to GND position.
(2) Rotate channel 1 VARIABLE control back and forth.
(3) Adjust VR8 for zero minimum vertical shift of trace as channel 1 VARIABLE control is rotated.

Channel 1 Attenuator Balance adjustment

(1) Select channel 1 AC-GND-DC switch to GND position.
(2) Rotate channel 1 VERT ATT control back and forth.
(3) Adjust VR3 for zero or minimum vertical shift of trace as VERT ATT control is rotated.

Channel 2 DC Balance adjustment

(1) Select the channel 2 AC-GND-DC switch to GND position.
(2) Rotate channel 2 VARIABLE control back and forth.
(3) Adjust VR18 for zero or minimum vertical shift of trace as VARIABLE control is rotated.

Channel 2 Attenuator Balance adjustment

(1) Select channel 2 AC-GND-DC switch to GND position.
(2) Rotate channel 2 VERT ATT control back and forth.
(3) Adjust VR13 for zero or minimum vertical shift of trace as VERT ATT control.

Channel 1 Position Center adjustment

(1) Select channel 1 AC-GND-DC switch to GND position and channel 1 ▲▼ POSITION control to its mechanical center (12 o'clock position).
(2) Adjust VR4 so that the trace is superimposed in exact vertical center of screen.
(3) Rotate ▲▼ POSITION control to fully clockwise position. Trace must move up at least 5 divisions.
(4) Rotate channel 1 ▲▼ POSITION control to fully counterclockwise position. Trace must move at least 5 divisions below center line.

Channel 2 Position Center adjustment

(1) Select the channel 2 AC-GND-DC switch to GND position and channel 2 ▲▼ POSITION control to its mechanical center (12 o'clock position).
(2) Adjust VR14 so the trace is superimposed in exact vertical center screen.
(3) Rotate channel 2 ▲▼ POSITION control to fully clockwise position. Trace must move up at least 5 divisions.
(4) Rotate channel 2 ▲▼ POSITION control to fully counterclockwise position. Trace must move at least 5 divisions below center line.

Channel 1 Gain adjustment

(1) Select channel 1 VERT ATT control to 1/1 position and VARIABLE control to its maximum clockwise position.
(2) Apply a 50mV peak to peak 1 kHz square wave signal to channel 1 input jack.
(3) Adjust VR1 for exactly 5 divisions vertical amplitude.

Channel 2 Gain adjustment

(1) Select channel 2 VERT ATT control to 1/1 position and VARIABLE control to its maximum clockwise position.
(2) Apply a 50 mV peak to peak 1 kHz square wave signal to channel 2 input jack.
(3) Adjust VR11 for exactly 5 divisions vertical amplitude.

Channel 1 Wave Shape

(1) Apply a 1 kHz square wave signal to channel 1 input jack to display a waveform of 4 to 7 divisions vertical amplitude.
(2) Adjust the trimmer capacitors in the sequence listed below for best square wave characteristic.

VERT ATT	Adj control
1/1	check
1/10	TC1
1/100	TC2

Table 4

ADJUSTMENT

Channel 2 Wave Shape

(1) Select the DISPLAY MODE to CH2 position.
(2) Apply a 1 kHz square wave signal to channel 2 input jack to display a waveform of 4 to 7 divisions vertical amplitude.
(3) Adjust the trimmer capacitors in sequence listed in table below for the best square wave.

VERT ATT	Adj control
1/1	check
1/10	TC6
1/100	TC7

Table 5

Channel 1 Overshoot Compensation

(1) Select the SWEEP RANGE to 20 kHz ~ 100 kHz position.
(2) Apply a 100 kHz square wave signal to channel 1 input jack to display a waveform of 4 divisions vertical amplitude.
(3) Adjust the trimmer capacitors in the sequence listed below for the best square wave characteristic.

Sequence	Adj cont.	Procedure
1	VR7	High frequency range compensation for the best flat-top waveform. However, do not completely eliminate overshoot, as high frequency response will be degraded.
2	TC12	Mid frequency range compensation for the best flat-top waveform.
3	TC5	High frequency range compensation for the best flat-top waveform.

Table 6

Channel 2 Overshoot Compensation

(1) Select the DISPLAY MODE to CH2 position.
(2) Apply a 100 kHz square wave signal to channel 2 input jack to display a waveform of 4 divisions vertical amplitude.
(3) Adjust TC10 for the best flat-top waveform in the high frequency range.

HORIZONTAL AXIS ADJUSTMENT

Sweep Width adjustment

(1) Select the channel 1 VERT ATT control to 1/100 range, SWEEP RANGE control to 0.2 ~ 1 kHz range and SWEEP VARIABLE control to maximum clockwise position.
(2) Apply a 0.5 ms marker signal to channel 1 input jack.
(3) Adjust VR4 so the 2nd markers span exactly 6 horizontal divisions on the display.

Horizontal Position adjustment

(1) Perform "Sweep width" adjustment.
(2) Rotate the ◄► POSITION control to its mechanical center position.
(3) Adjust VR5 so the 1st marker exactly coincides with the extreme left line on the graticule scale.

Sweep Range adjustment

(1) Select the channel 1 VERT ATT control to 1/100 range, SWEEP RANGE to between 1 and 5 kHz range and SWEEP VARIABLE control to maximum clockwise position.
(2) Apply a 0.1ms marker signal to channel 1 input jack.
(3) Adjust TC1 so the 2nd markers span exactly 6 horizontal divisions on the display.

X Position Centering adjustment

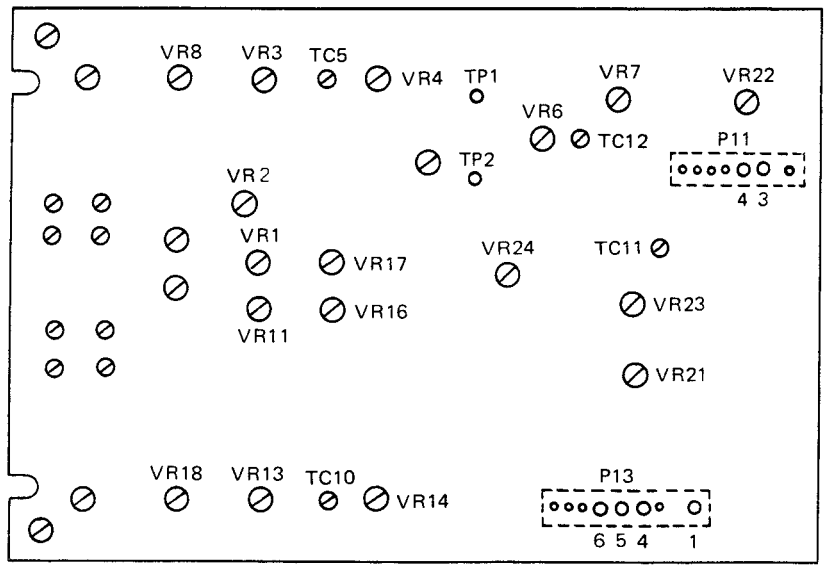
(1) Select together channel 1 and channel 2 AC-GND-DC switches to GND positions.
(2) Select the DISPLAY MODE switch to CH2 positions.
(3) Adjust channel 1 and channel 2 ◄► POSITION controls to superimpose both traces in the vertical center of the screen.
(4) Select the DISPLAY MODE switch to X-Y position.
(5) Adjust VR16 so the spot is in horizontal center of the screen.

X Gain adjustment

(1) Select the DISPLAY MODE switch to X-Y position.
(2) Apply a 150 mV peak to peak 1 kHz square wave signal to channel 1 input jack.
(3) Adjust VR17 for 6 divisions of horizontal deflection (may appear as two dots, 6 divisions apart).

ADJUSTMENT

X65-1220-02



X74-1110-02

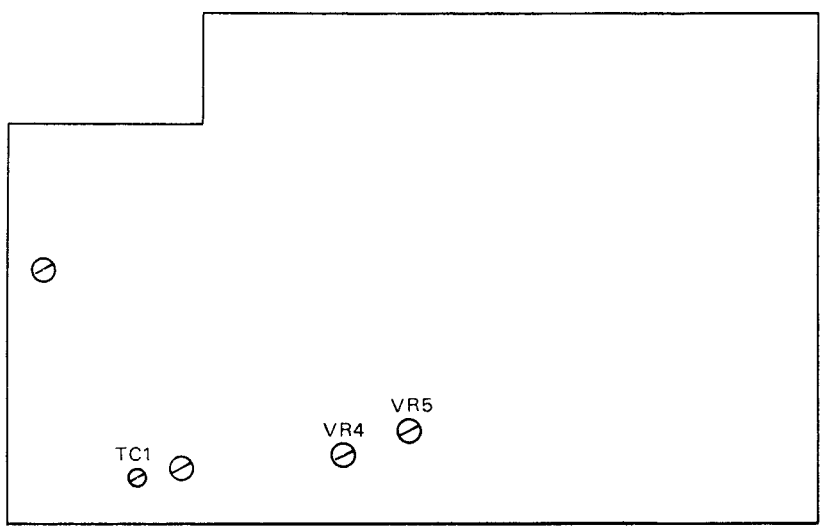
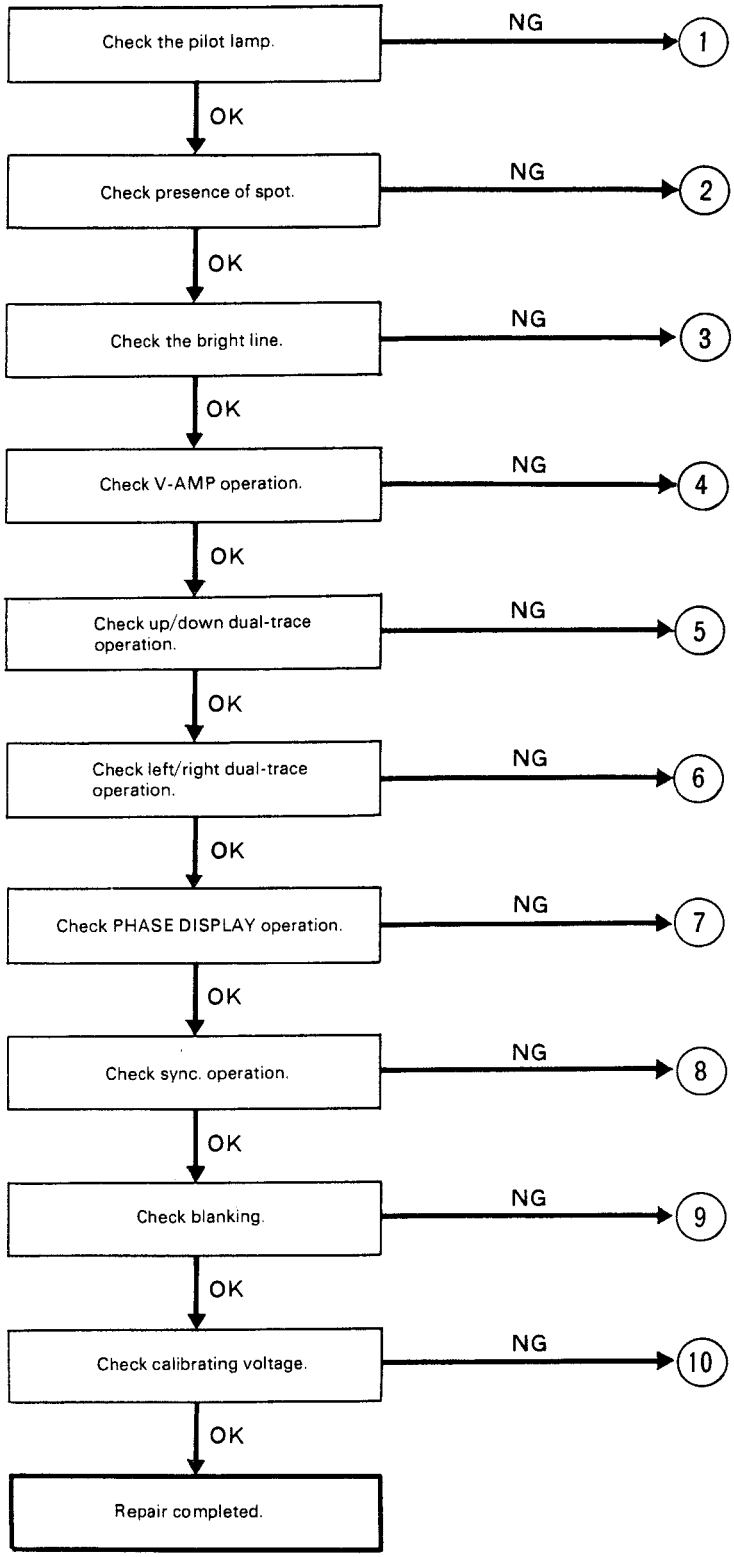


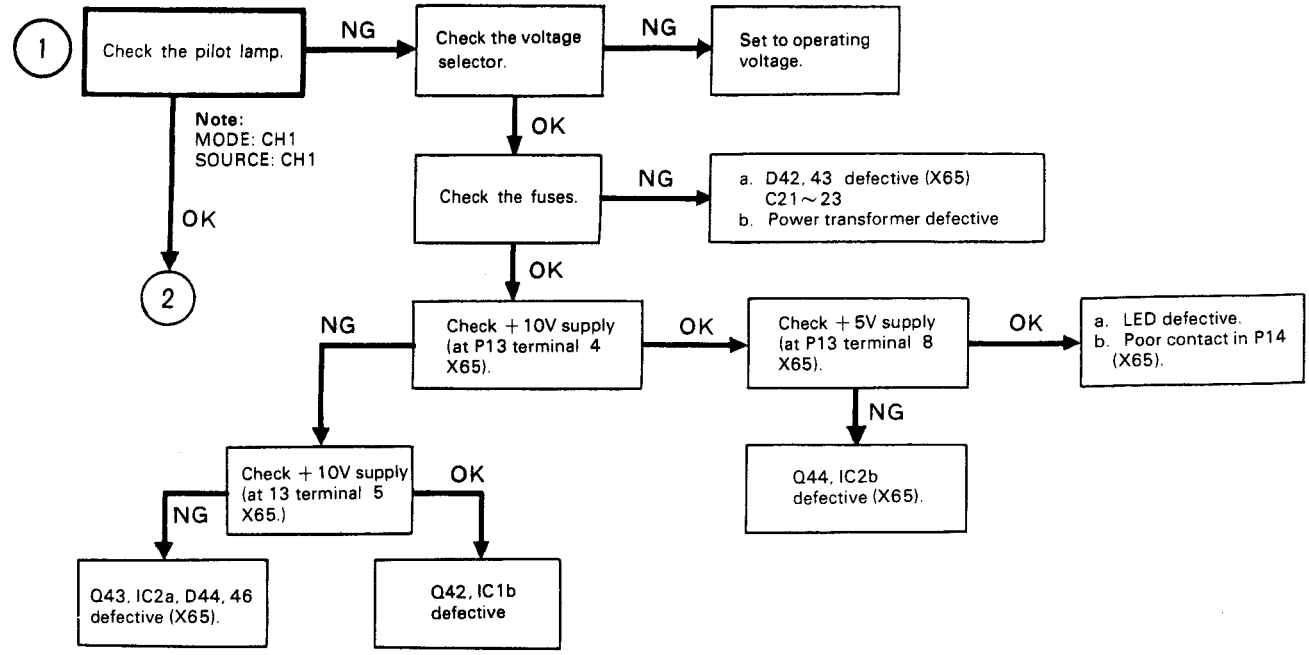
Fig. 5 Locations of adjustment controls

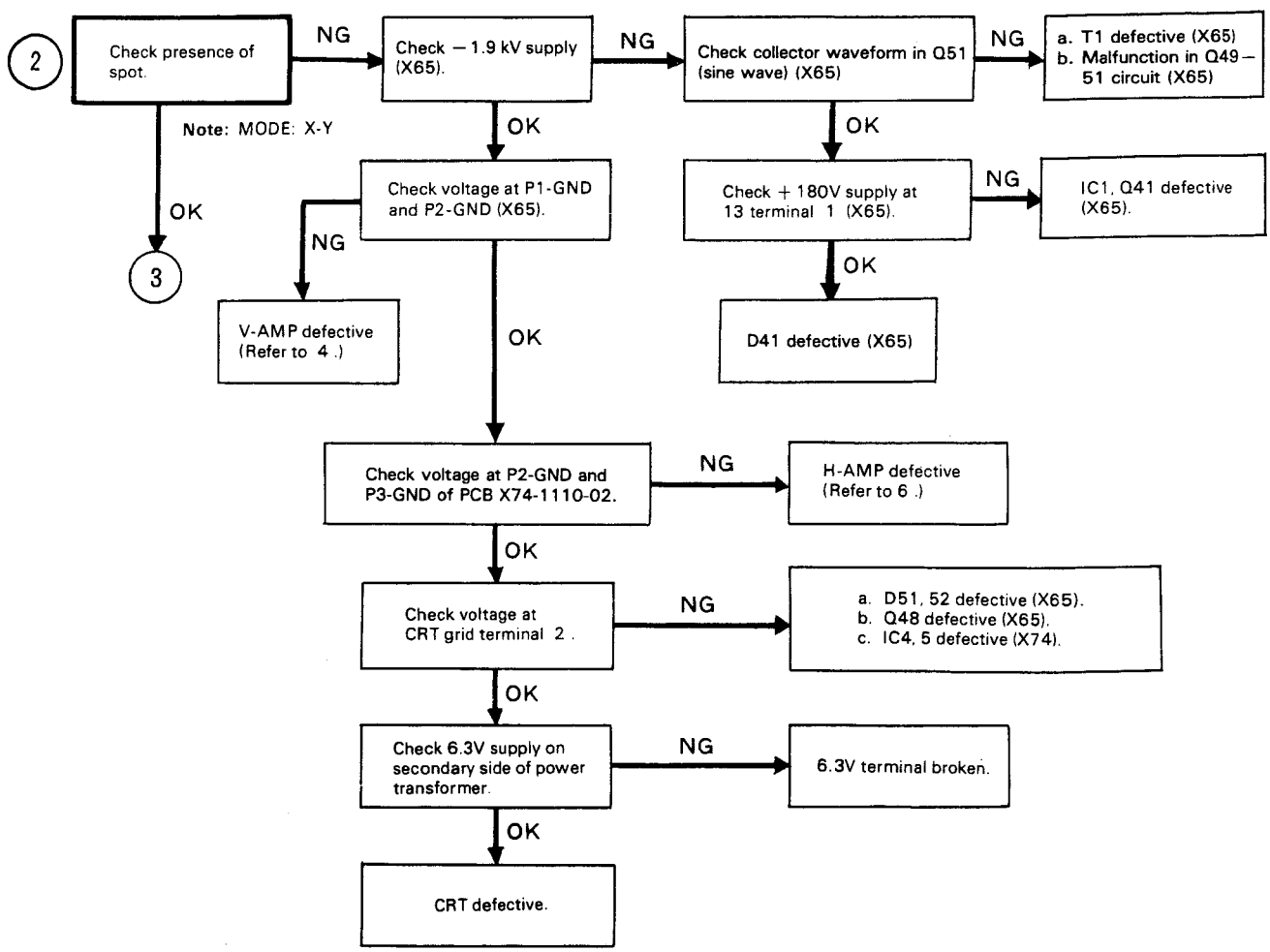
TROUBLESHOOTING

Troubleshooting

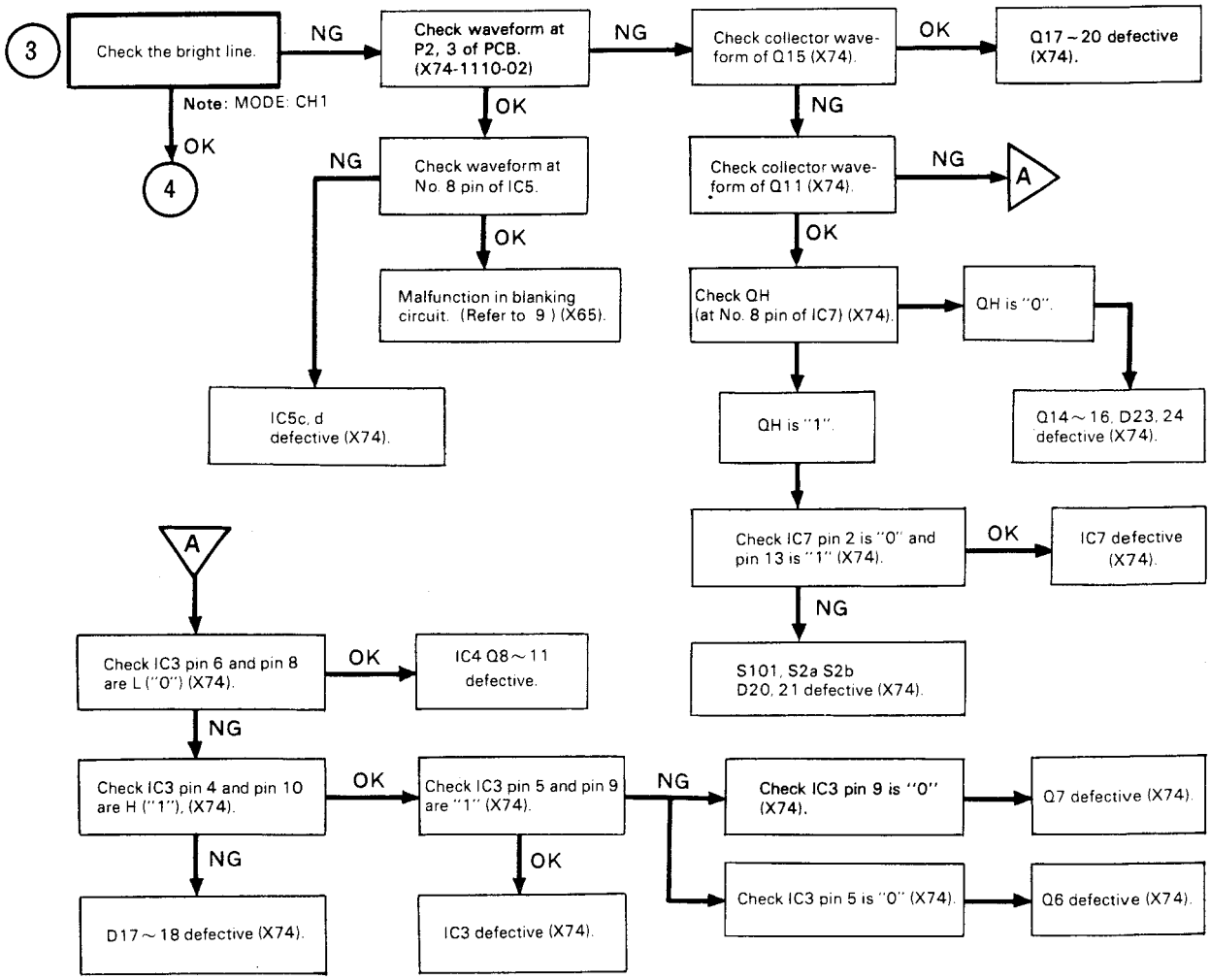


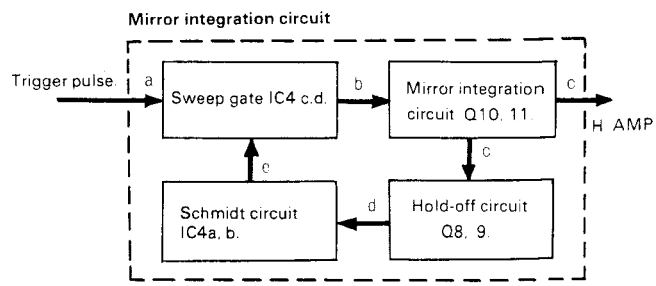
TROUBLESHOOTING





TROUBLESHOOTING





Function of Mirror Integration Circuit (Fig. 6)

When no input signal is applied to the trigger amplifier, no trigger pulses will be generated and thus IC4 pin-13 is "0" and pin 11 is "1". When input signal "1" is fed to IC4 pin-10, IC4 pin-8 becomes "0" and D14 in the sweep circuit turns OFF, causing the mirror integration circuit (Q10, 11) to start operating (see "C" in Fig. 6.).

At this time the charge voltage is applied to the Schmidt circuit (IC4a, b) through Q8 and Q9 and when it reaches the threshold level (about 2.5 V), the outputs of IC4a, b are inverted, inverting "C" of IC4 from "0" to "1".

This turns D14 to on and the voltage is discharged quickly, since D13 is OFF, the voltage charged in the hold-off capacitor through Q8 is also discharged via R42, which is fed to the Schmidt circuit through Q9, thereby inverting the output and set it to the original state.

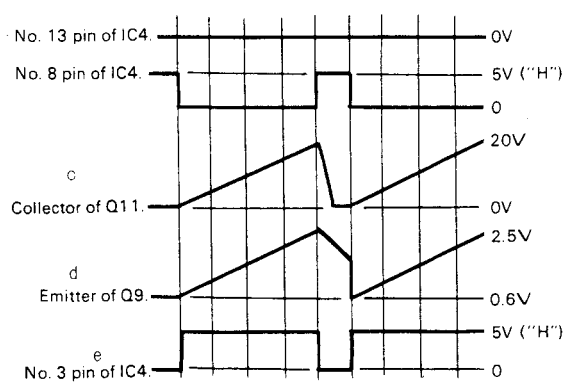


Fig. 6

TROUBLESHOOTING

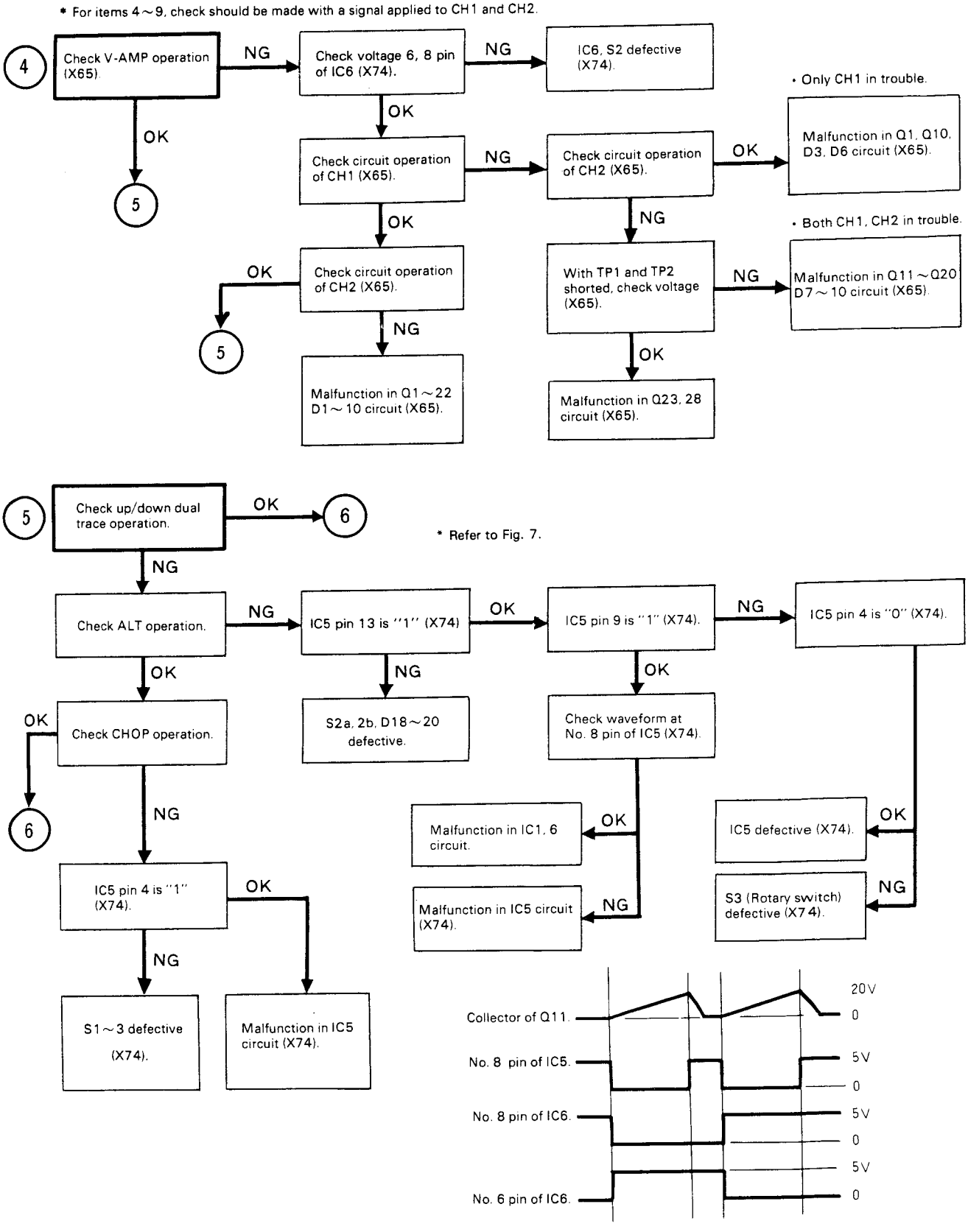
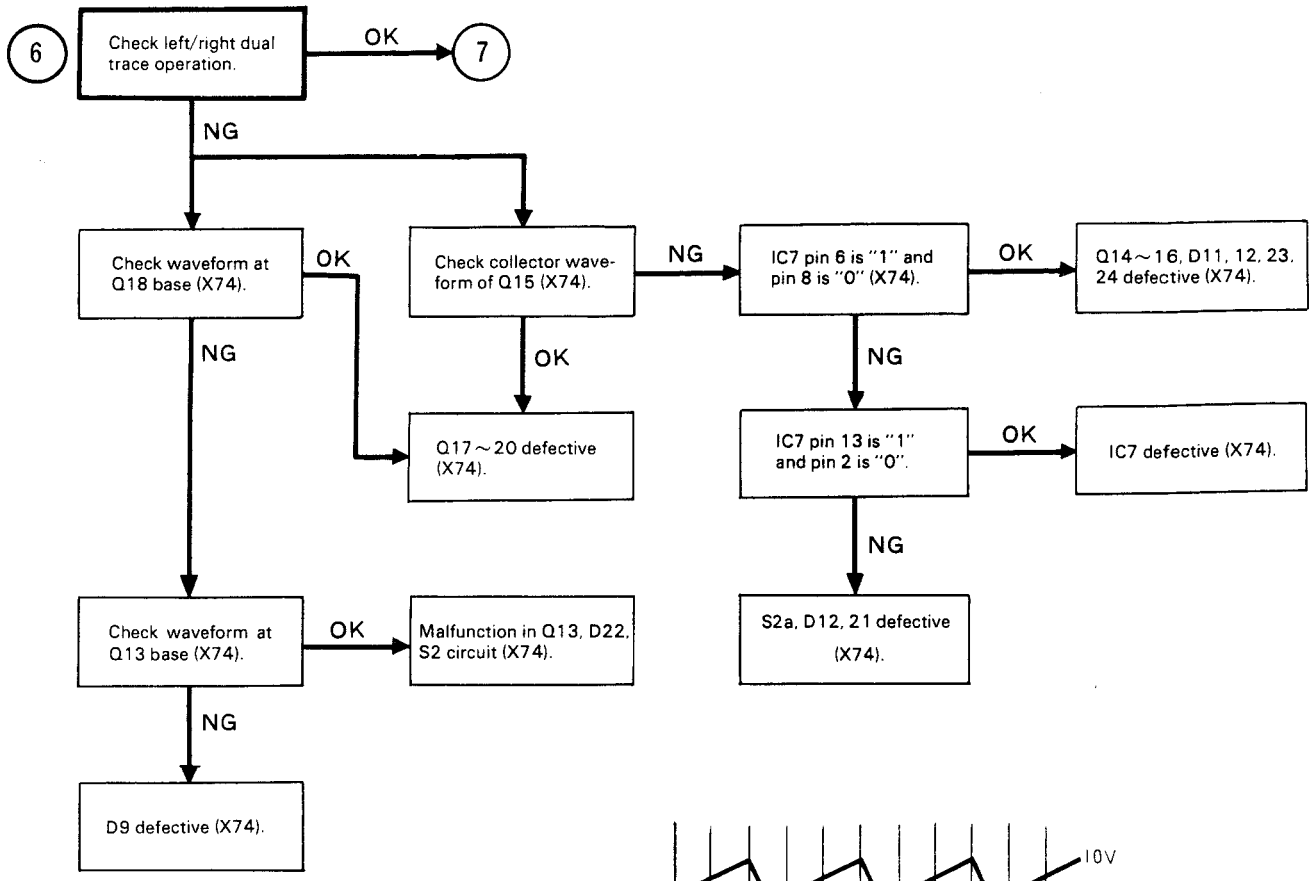


Fig. 7

TROUBLESHOOTING



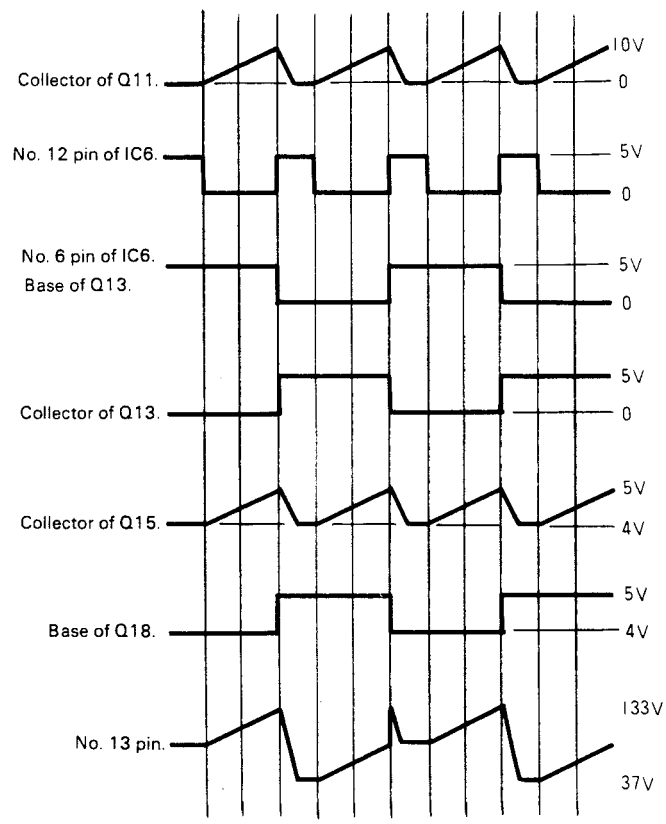
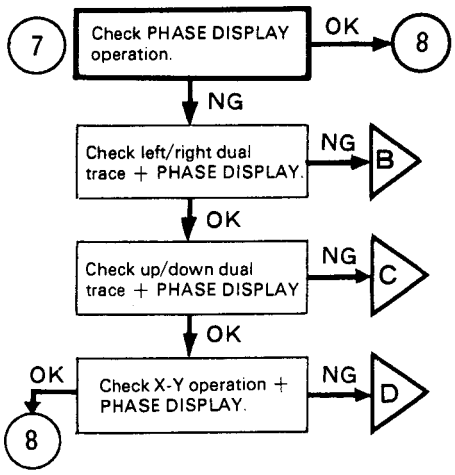
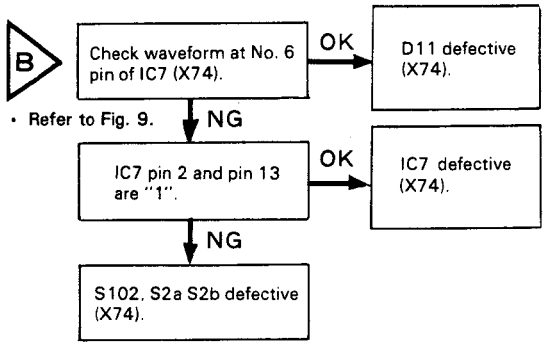
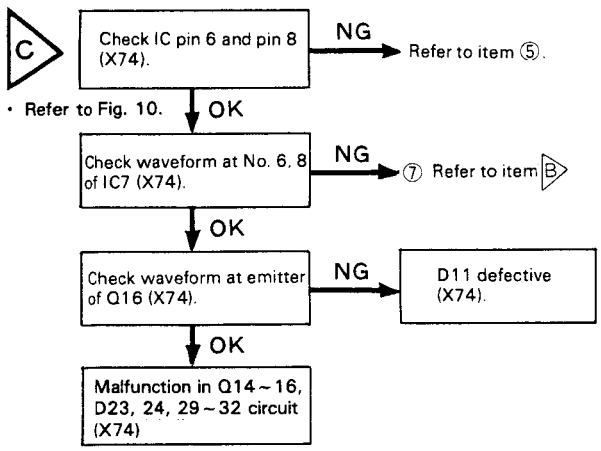


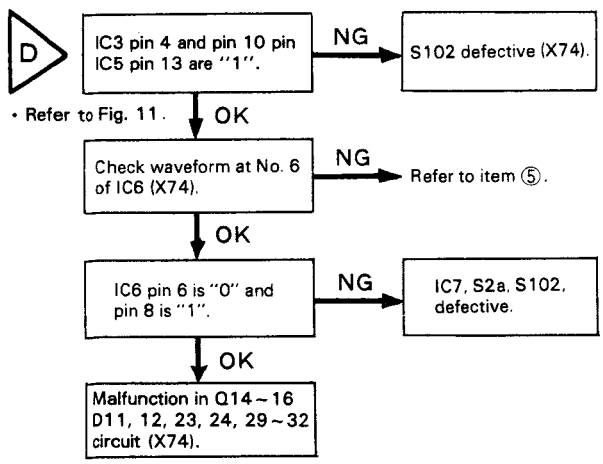
Fig. 8

TROUBLESHOOTING








D
IC3 pin 4 and pin 10 pin IC5 pin 13 are "1".
NG
S102 defective (X74).
• Refer to Fig. 11.
OK
Check waveform at No. 6 of IC6 (X74).
NG
Refer to item ⑤.
OK
IC6 pin 6 is "0" and pin 8 is "1".
NG
IC7, S2a, S102, defective.
OK
Malfunction in Q14~16 D11, 12, 23, 24, 29~32 circuit (X74).

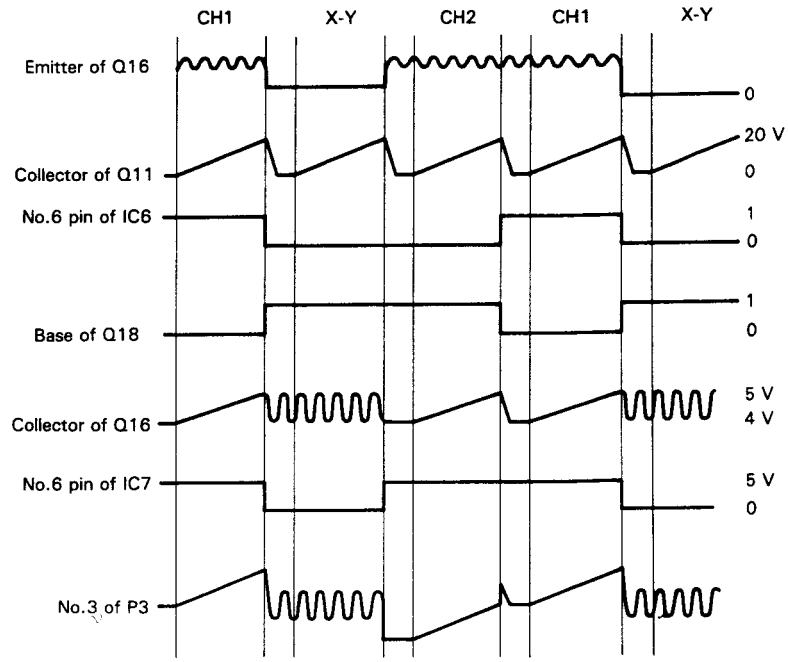


Fig. 9

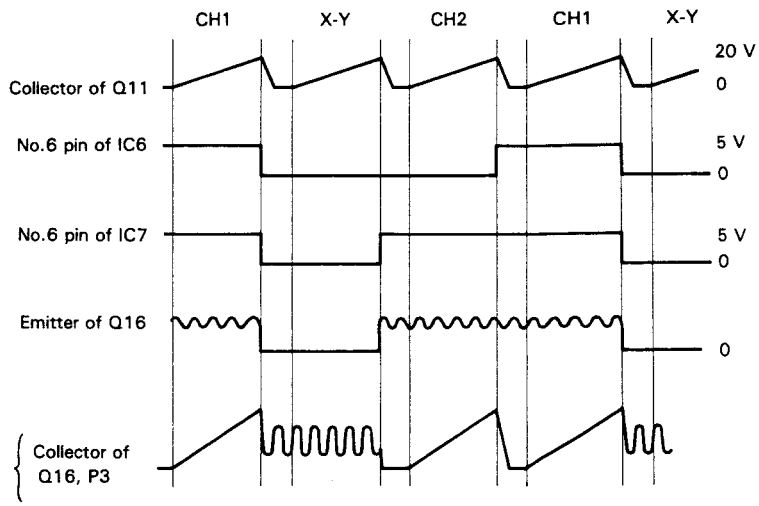


Fig. 10

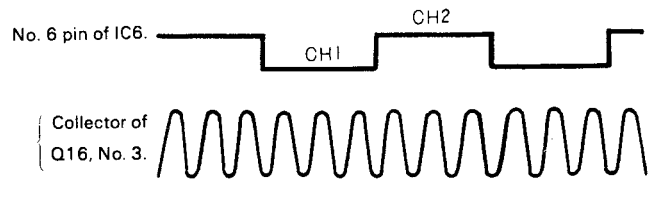
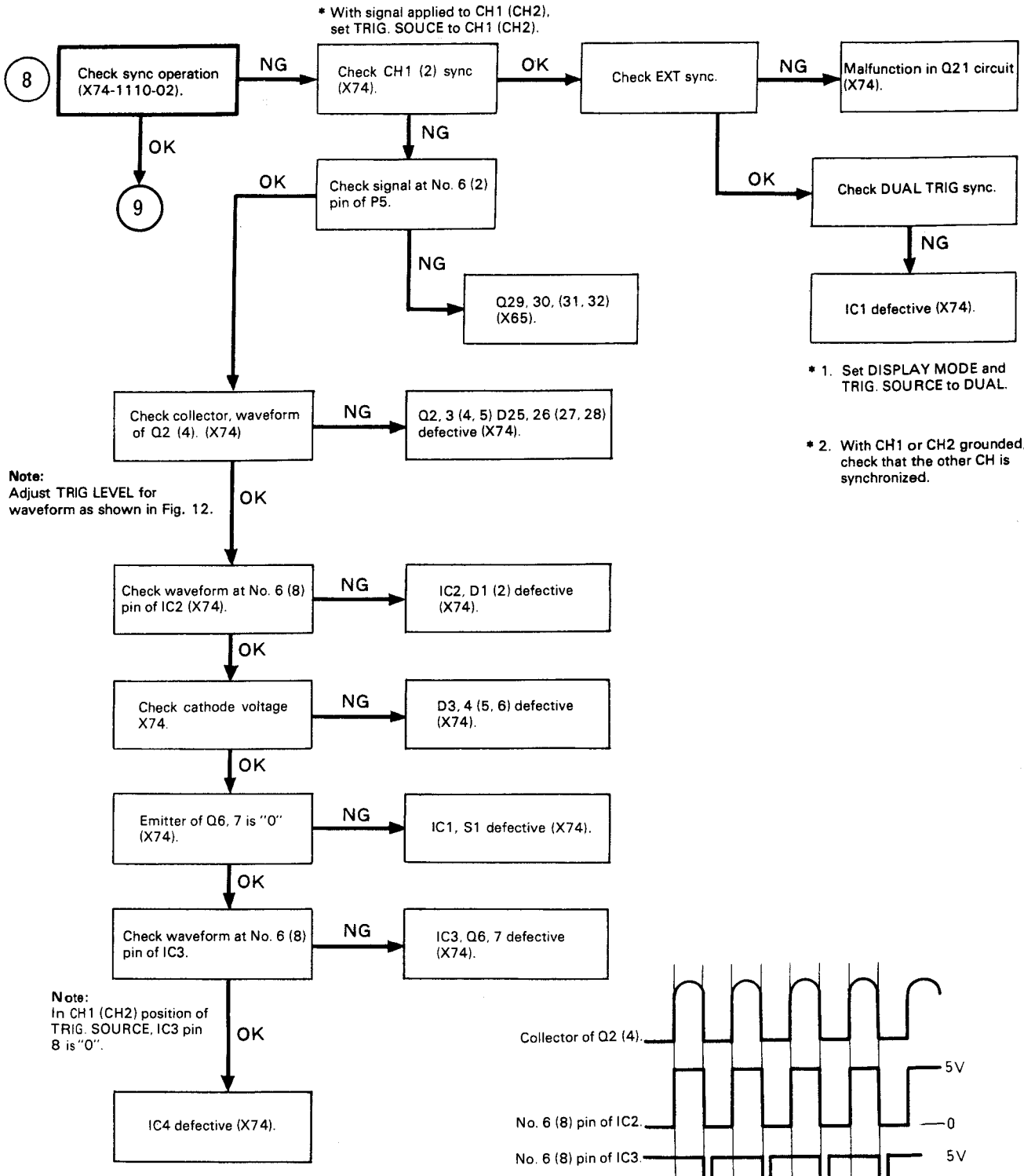


Fig. 11

TROUBLESHOOTING


* With signal applied to CH1 (CH2), set TRIG. SOUCE to CH1 (CH2).
8
Check sync operation (X74-1110-02).
NG
Check CH1 (2) sync (X74).
OK
Check EXT sync.
NG
Malfunction in Q21 circuit (X74).
OK
9
NG
OK
Check signal at No. 6 (2) pin of P5.
NG
Q29, 30, (31, 32) (X65).
OK
Check DUAL TRIG sync.
NG
IC1 defective (X74).
* 1. Set DISPLAY MODE and TRIG. SOURCE to DUAL.
* 2. With CH1 or CH2 grounded, check that the other CH is synchronized.
Check collector, waveform of Q2 (4). (X74)
NG
Q2, 3 (4, 5) D25, 26 (27, 28) defective (X74).
Note:
Adjust TRIG LEVEL for waveform as shown in Fig. 12.
OK
Check waveform at No. 6 (8) pin of IC2 (X74).
NG
IC2, D1 (2) defective (X74).
OK
Check cathode voltage X74.
NG
D3, 4 (5, 6) defective (X74).
OK
Emitter of Q6, 7 is "0" (X74).
NG
IC1, S1 defective (X74).
OK
Check waveform at No. 6 (8) pin of IC3.
NG
IC3, Q6, 7 defective (X74).
Note:
In CH1 (CH2) position of TRIG. SOURCE, IC3 pin 8 is "0".
OK
IC4 defective (X74).
* Add any signal to CH1 or CH2 EXT TRIG. terminal.

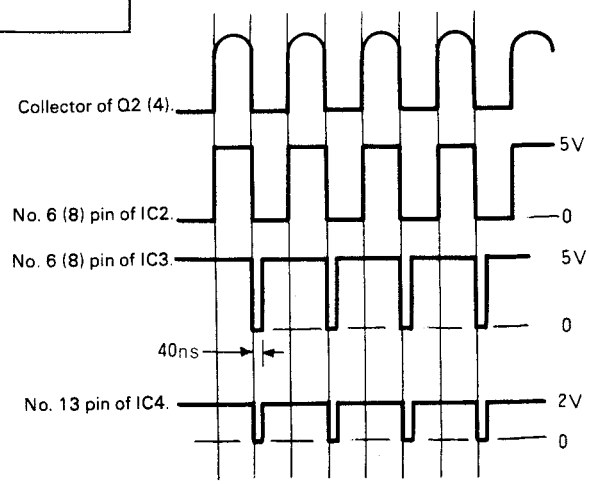
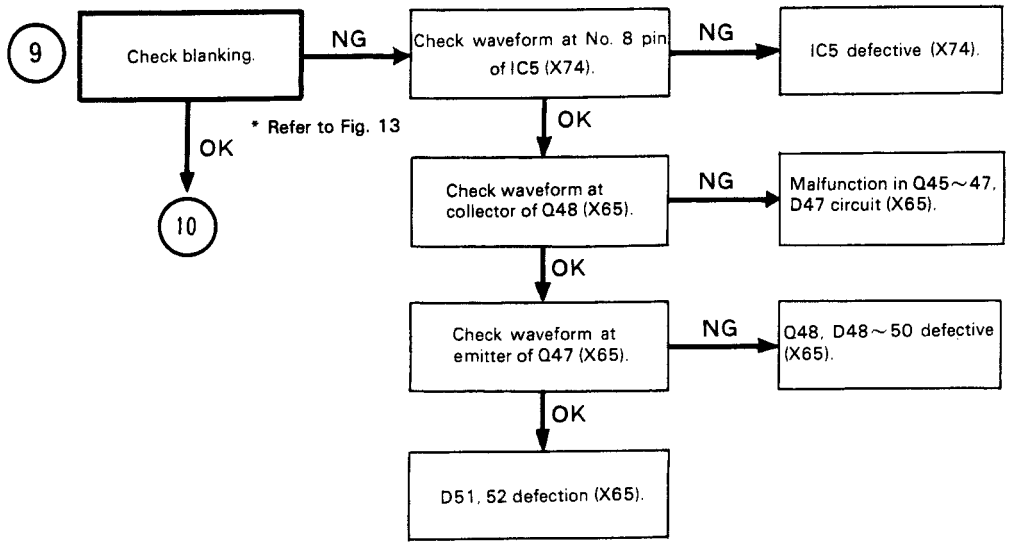


Fig. 12

TROUBLESHOOTING



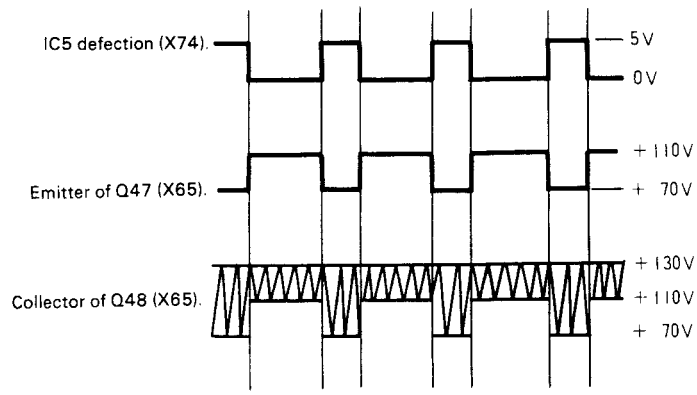
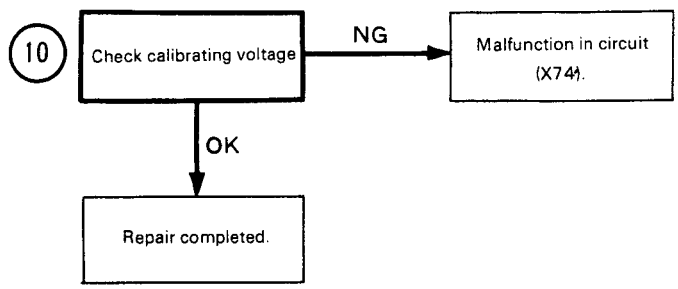


Fig. 13



PARTS LIST

MAIN CHASSIS

Y70-1500-21

	REF.NO	PARTS NO	NAME & DESCRIPTION
1		A01-1126-02	CASE
2		A10-1419-32	CHASSIS
3		A20-2776-02	PANEL
4		A21-1063-03	DECORATIVE PANEL
5		A23-1653-02	REAR PANEL
6		A40-0705-12	BOTTOM PLATE
7		B07-0704-04	ESCUTCHEON
8		B07-0707-03	ESCUTCHEON
9		B20-0901-14	SCALE
		B40-2765-04	NAME PLATE (SERIAL NO)
10		B40-2810-03	NAME PLATE
		B41-0701-14	CAUTION LABEL
		B50-7549-00	INSTRUCTION MANUAL
11		E01-1403-05	CRT SOCKET
12		E04-0251-05	BNC RECEPTACLE
13		E18-0351-05	INLET 3 P
14		E21-0654-04	TERMINAL (CAL)
		E23-0018-04	EARTH LUG
		E30-1818-05	POWER CORD (JIS)
		E33-0911-00	WIRE ASSY
47		F07-0901-04	PROTECTION COVER
15		F10-1524-04	SHIELD PLATE
16		F11-0230-13	SHIELD CASE
17		F11-0902-13	SHIELD CASE
		F15-0138-04	BLIND PLATE
		F15-0186-04	BLIND PLATE
		F15-0701-04	BLIND PLATE
18		G13-0090-04	CUSHION
		H01-5743-04	CARTON BOX
		H10-2801-03	FOAMED STYRENE PAD
		H20-1701-24	VINYL COVER
		H25-0029-04	POLYETHYLENE BAG
19		J02-0501-05	LEG
20		J10-0072-02	BEZEL
		J10-0404-03	BEZEL
21		J13-0033-15	FUSE HOLDER
22		J19-0457-14	CRT BAND
23		J19-0458-14	CRT BAND
24		J21-2802-04	BLACKET FOR PCB
25		J21-2817-14	BLACKET FOR SW
26		J21-2851-03	BLACKET FOR TRANSFORMER
		J61-0039-05	CRIP FOR LEAD
		J61-0049-05	WIRE BAND
27		K01-0518-05	HANDLE
28		K21-0819-03	KNOB
29		K21-0820-04	KNOB
30		K21-0822-14	KNOB
31		K21-0825-04	KNOB
32		K27-0507-04	KNOB
33		K27-0525-04	KNOB
34		K27-0526-04	KNOB FOR LEVER
		N08-0606-05	DRESSED SCREW
		N09-0078-05	SCREW
		N10-2030-46	NUT, HEX
		N10-2040-46	NUT
		N10-2060-46	NUT
		N15-1030-41	WASHER, FLAT FOR M3
		N15-1040-46	WASHER
		N16-0060-46	SPRING WASHER
		N17-1030-46	TOOTHED LOCK WASHER FOR M3
		N19-0702-04	WASHER
		N19-0704-04	WASHER
		N30-3006-41	SCREW, PAN HD M 3X6
		N30-3008-41	SCREW, PAN HD M 3X8
		N30-3010-41	SCREW, PAN HD M 3X10
		N30-3014-46	SCREW, PAN HD M 3X14
		N30-4006-41	SCREW, PAN HD M 4X6
		N30-4040-46	SCREW, PAN HD M 4X40
		N32-3006-46	SCREW, FLAT HD M 3X6
		N88-3008-41	SCREW, FLAT HD TAP TITE
		N89-3006-41	SCREW, BINDING TAP TITE
		N89-3006-46	SCREW, BINDING TAP TITE
		N89-3010-46	SCREW, BINDING TAP TITE
35		W01-0058-04	CORD WRAP
36		X65-1220-02	VERT/POWER SUPPLY UNIT
37		X74-1110-02	SWEEP UNIT
38		X77-1020-00	VOLTAGE SECTOR UNIT
		Y87-1450-00	ACCESSORY CORD CA-41
39		130BEB31	CRT
		212-1018-05	TUBE (PLASTIC)
40	D101	B30-0904-15	LAMP
41	F101	F05-3011-05	FUSE 0.3A
41	F101	F05-7011-05	FUSE 0.7A
	J101	E31-2515-05	LEAD WIRE WITH CONNECTOR
	J102	E31-2516-05	LEAD WIRE WITH CONNECTOR
	J103	NO USE	
	J104	E31-0543-05	LEAD WIRE WITH CONNECTOR
	J105	E31-0539-15	LEAD WIRE WITH CONNECTOR
	J106	B30-0904-15	LAMP

REF.NO	PARTS NO	NAME & DESCRIPTION
J111	E31-0540-05	LEAD WIRE WITH CONNECTOR
J112	E31-0541-15	LEAD WIRE WITH CONNECTOR
J113	E30-0554-25	LEAD WIRE WITH CONNECTOR
J114	E31-0507-15	LEAD WIRE WITH CONNECTOR
J115	E31-0509-15	LEAD WIRE WITH CONNECTOR
J116	E31-0509-15	LEAD WIRE WITH CONNECTOR
J117	E31-0509-15	LEAD WIRE WITH CONNECTOR
J118	E31-0509-15	LEAD WIRE WITH CONNECTOR
J119	E31-0538-05	LEAD WIRE WITH CONNECTOR
J120	NO USE	
J121	E31-0532-05	LEAD WIRE WITH CONNECTOR
42 J124	L01-9116-05	POWER TRANSFORMER
R001	RD14BB2E470J	RES. CARBON 47 5% 1/4W
R002	RD14BB2E470J	RES. CARBON 47 5% 1/4W
43 S101	R03-1021-05	
44 S102	S40-2501-05	PUSH SWITCH
43 VR101	R03-1021-05	V.R. 1K B
45 VR102	R05-8001-05	V.R. 3M B
VR103	NO USE	
46 VR104	R06-1501-05	V.R. 2K B X2

PARTS LIST

X65-1220-02

REF.NO	PARTS NO	NAME & DESCRIPTION			
	E33-4068-00	WIRE ASSY			
	F01-0231-14	HEAT SINK			
	F01-0813-05	HEAT SINK			
	F10-1526-04	SHIELD PLATE			
	F11-0147-24	SHIELD CASE			
	F20-0622-05	INSULATOR			
	J25-2827-32	PCB (UNMOUNTED)			
	N10-2030-46	NUT, HEX			
	N17-1030-41	LOCK WASHER			
	N19-0191-05	WASHER NONMETAL			
	N30-3004-46	SCREW, PAN HD	M 3X4		
	N30-3008-46	SCREW, PAN HD	M 3X8		
	R92-0150-05	JUMPING RES.	ZERO OHM		
	001-1001-05	COATING WIRE			
C001	C91-0501-05	CAP. METAL FILM	0.047	10%	630V
C002	CM93BD2A470J	CAP. MICA	47P	5%	100V
C003	CM93BD2A471J	CAP. MICA	470P	5%	100V
C004	C91-0502-05	CAP. METAL FILM	0.01	20%	630V
C005	CC45CH1H680J	CAP. CERAMIC	68P	5%	50V
C006	CC45CH1H680J	CAP. CERAMIC	68P	5%	50V
C007	NO USE				
C008	CC45CH1H181J	CAP. CERAMIC	180P	5%	50V
C009	CC45CH1H470J	CAP. CERAMIC	47P	5%	50V
C010	CC45CH1H680J	CAP. CERAMIC	68P	5%	50V
C011	C91-0501-05	CAP. METAL FILM	0.047	10%	630V
C012	CM93BD2A470J	CAP. MICA	47P	5%	100V
C013	CM93BD2A471J	CAP. MICA	470P	5%	100V
C014	C91-0502-05	CAP. METAL FILM	0.01	20%	630V
C015	CC45CH1H470J	CAP. CERAMIC	47P	5%	50V
C016	CC45CH1H330J	CAP. CERAMIC	33P	5%	50V
C017	NO USE				
C018	CC45CH1H470J	CAP. CERAMIC	47P	5%	50V
C019	CE04W1A101	CAP. ELECTRO	100		10V
C020	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C021	CE04W2F330	CAP. ELECTRO	33		310V
C022	CE04W1E102	CAP. ELECTRO	1000		25V
C023	CE04W1E222	CAP. ELECTRO	2200		25V
C024	CE04W2E100	CAP. ELECTRO	10		250V
C025	CE04W1E101	CAP. ELECTRO	100		25V
C026	CE04W1E101	CAP. ELECTRO	100		25V
C027	CE04W1A101	CAP. ELECTRO	100		10V
C028	CE04W1C101	CAP. ELECTRO	100		16V
C029	CE04W1C101	CAP. ELECTRO	100		16V
C030	CK45B2H103K	CAP. CERAMIC	0.01	10%	500V
C031	CK45B2H103K	CAP. CERAMIC	0.01	10%	500V
C032	CK45E3D103P	CAP. CERAMIC	0.01		2K
C033	CK45E3D103P	CAP. CERAMIC	0.01		2K
C034	CK45E3D103P	CAP. CERAMIC	0.01		2K
C035	CK45E3D103P	CAP. CERAMIC	0.01		2K
C036	CK45B2H103K	CAP. CERAMIC	0.01	10%	500V
C037	CE04W2E3R3	CAP. ELECTRO	3.3		250V
C038	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C039	C093M1H682K	CAP. MYLAR	6800P	10%	50V
C040	CE04W1H471	CAP. ELECTRO	470		50V
C041	CE04BW1HR47M	CAP. ELECTRO	0.47	20%	50V
C042	CK45E3D102P	CAP. CERAMIC	1000P		2K
C043	CE04W1A101	CAP. ELECTRO	100		10V
C044	CC45CH2H020C	CAP. CERAMIC	2P	0.25P	500V
C045	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C046	CE04W2E3R3	CAP. ELECTRO	3.3		250V
C049	CE04W1E100	CAP. ELECTRO	10		25V
C054	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C055	NO USE				
C056	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C060	CE04W1E100	CAP. ELECTRO	10		25V
C061	NO USE				
C062	CC45CH1H100D	CAP. CERAMIC	10P	0.5P	50V
C063	CC45CH1H100D	CAP. CERAMIC	10P	0.5P	50V
C064	CC45CH1H330J	CAP. CERAMIC	33P	5%	50V
C069	CC45CH2H100D	CAP. CERAMIC	10P	0.5P	500V
C070	CC45CH2H100D	CAP. CERAMIC	10P	0.5P	500V
C071	CC45CH2H100D	CAP. CERAMIC	10P	0.5P	500V
C072	CC45CH2H100D	CAP. CERAMIC	10P	0.5P	500V
D001	1S1555	DIODE			
D002	1S1555	DIODE			
D003	1S1555	DIODE			
D004	1S1555	DIODE			
D005	1S1555	DIODE			
D006	1S1555	DIODE			
D007	1S1555	DIODE			
D008	1S1555	DIODE			
D009	1S1555	DIODE			
D010	1S1555	DIODE			
D011	MTZ3.0JB	DIODE, ZENER	3.0V		
D041	Y16JA	DIODE			
D042	S1VB60	DIODE			
D043	S1VB60	DIODE			
D044	MTZ10JC	DIODE, ZENER	10V		

REF.NO	PARTS NO	NAME & DESCRIPTION			
D045	1S1555	DIODE			
D046	1S1555	DIODE			
D047	MTZ5.1JB	DIODE, ZENER	5V		
D048	1S1555	DIODE			
D049	W06C	DIODE			
D050	1SS83	DIODE			
D051	W06C	DIODE			
D052	W06C	DIODE			
D053	1S1555	DIODE			
D054	1S1555	DIODE			
IC001	UPC4558C	IC			
IC002	UPC4558C	IC			
L001	L40-4711-03	FERRI INDUCTOR	470UH		
L002	L40-4791-02	FERRI INDUCTOR	4.7UH		
N001	NE-2	NEON GLOW LAMP			
N002	NE-2	NEON GLOW LAMP			
N003	NE-2	NEON GLOW LAMP			
P001	E23-0047-04	TERMINAL			
P002	E23-0047-04	TERMINAL			
P003	E40-0503-05	PIN CONNECTOR	5 P		
P004	E40-0303-05	PIN CONNECTOR	3 P		
P011	E40-0703-05	PIN CONNECTOR	7 P		
P012	E40-0303-05	PIN CONNECTOR	3 P		
P013	E40-0936-05	PIN CONNECTOR	9 P		
P014	E40-0303-05	PIN CONNECTOR	3 P		
P015	E40-0532-05	PIN CONNECTOR	5 P		
P016	E40-0201-05	PIN CONNECTOR	2 P		
Q001	2SK30A(D)	FET,N-CHANNEL			
Q002	UPA71A(K,L)	FET,DUAL-CHANNEL			
Q003	2SC945(P)	TR. SI, NPN			
Q004	2SC945(P)	TR. SI, NPN			
Q005	2SA733(Q)	TR. SI, PNP			
Q006	2SA733(Q)	TR. SI, PNP			
Q007	2SC945(Q)	TR. SI, NPN			
Q008	2SC945(Q)	TR. SI, NPN			
Q009	2SC945(P)	TR. SI, NPN			
Q010	2SC945(P)	TR. SI, NPN			
Q011	2SK30A(D)	FET,N-CHANNEL			
Q012	UPA71A(K,L)	FET,DUAL-CHANNEL			
Q013	2SC945(P)	TR. SI, NPN			
Q014	2SC945(P)	TR. SI, NPN			
Q015	2SA733(Q)	TR. SI, PNP			
Q016	2SA733(Q)	TR. SI, PNP			
Q017	2SC945(Q)	TR. SI, NPN			
Q018	2SC945(Q)	TR. SI, NPN			
Q019	2SC945(P)	TR. SI, NPN			
Q020	2SC945(P)	TR. SI, NPN			
Q021	2SC945(P)	TR. SI, NPN			
Q022	2SC945(P)	TR. SI, NPN			
Q023	2SC945(P)	TR. SI, NPN			
Q024	2SC945(P)	TR. SI, NPN			
Q025	2SC945(P)	TR. SI, NPN			
Q026	2SC945(P)	TR. SI, NPN			
Q027	2SC2068	TR. SI, NPN			
Q028	2SC2068	TR. SI, NPN			
Q029	2SC945(P)	TR. SI, NPN			
Q030	2SC945(P)	TR. SI, NPN			
Q031	2SC945(P)	TR. SI, NPN			
Q032	2SC945(P)	TR. SI, NPN			
Q041	2SB546A	TR. SI, PNP			
Q042	2SD1135(C)	TR, SI, NPN			
Q043	2SB633(E)	TR. SI, PNP			
Q044	2SD1135(C)	TR, SI, NPN			
Q045	2SC535(B)	TR. SI, NPN			
Q046	2SC2271(E)	TR. SI, NPN			
Q047	2SC2068	TR. SI, NPN			
Q048	2SC2271(E)	TR. SI, NPN			
Q049	2SC945(P)	TR. SI, NPN			
Q050	2SA733(Q)	TR. SI, PNP			
Q051	2SD401A(K)	TR. SI, NPN			
Q052	2SC2271(E)	TR. SI, NPN			
R001	RN14BK2H9003F	RES. METAL FILM	900K	1%	1/2W
R002	RN14BK2E1113F	RES. METAL FILM	111K	1%	1/4W
R003	RN14BK2H9903F	RES. METAL FILM	990K	1%	1/2W
R004	RN14BK2E1012F	RES. METAL FILM	10.1K	1%	1/4W
R005	RN14BK2H1004F	RES. METAL FILM	1M	1%	1/2W
R006	RD14BY2H104J	RES. CARBON	100K	5%	1/2W
R007	RD14CB2E101J	RES. CARBON	100	5%	1/4W
R008	RD14BB2E223J	RES. CARBON	22K	5%	1/4W
R009	RD14BB2E223J	RES. CARBON	22K	5%	1/4W
R010	RD14CB2E561J	RES. CARBON	560	5%	1/4W
R011	RD14BB2E332J	RES. CARBON	3.3K	5%	1/4W
R012	RD14CB2E392J	RES. CARBON	3.9K	5%	1/4W
R013	RD14CB2E470J	RES. CARBON	47	5%	1/4W
R014	RD14CB2E470J	RES. CARBON	47	5%	1/4W
R015	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R016	RN14BK2E3601G	RES. METAL FILM	3.6K	2%	1/4W
R017	RD14BB2E181J	RES. CARBON	180	5%	1/4W
R018	RN14BK2E8200F	RES. METAL FILM	820	1%	1/4W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R019	RD14BB2E120J	RES. CARBON	12	5%	1/4W
R020	RN14BK2E1600F	RES. METAL FILM	160	1%	1/4W
R021	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R022	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R023	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R024	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R025	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R026	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R027	RD14BB2E333J	RES. CARBON	33K	5%	1/4W
R028	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R029	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R030	RN14BK2E3001F	RES. METAL FILM	3K	1%	1/4W
R031	RN14BK2E3001F	RES. METAL FILM	3K	1%	1/4W
R032	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R033	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R034	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R035	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R036	RD14BB2E471J	RES. CARBON	470	5%	1/4W
R037	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R038	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R039	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R040	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R041	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R042	RD14BB2E221J	RES. CARBON	220	5%	1/4W
R043	RD14BB2E152J	RES. CARBON	1.5K	5%	1/4W
R044	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R045	RD14BB2E152J	RES. CARBON	1.5K	5%	1/4W
R046	RD14BB2E152J	RES. CARBON	1.5K	5%	1/4W
R047	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R048	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R049	RD14BB2E332J	RES. CARBON	3.3K	5%	1/4W
R050	RD14BB2E332J	RES. CARBON	3.3K	5%	1/4W
R051	RD14BB2E220J	RES. CARBON	22	5%	1/4W
R052	RD14BB2E220J	RES. CARBON	22	5%	1/4W
R053	RD14BB2E152J	RES. CARBON	1.5K	5%	1/4W
R054	RD14BB2E152J	RES. CARBON	1.5K	5%	1/4W
R055	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R056	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R057	RS14GB3F123J	RES. METAL FILM	12K	5%	3W
R058	RS14GB3F123J	RES. METAL FILM	12K	5%	3W
R059	RD14BB2E271J	RES. CAREON	270	5%	1/4W
R060	RD14CB2E101J	RES. CARBON	100	5%	1/4W
R061	RN14BK2H9003F	RES. METAL FILM	900K	1%	1/2W
R062	RN14BK2E1113F	RES. METAL FILM	111K	1%	1/4W
R063	RN14BK2H9903F	RES. METAL FILM	990K	1%	1/2W
R064	RN14BK2E1012F	RES. METAL FILM	10.1K	1%	1/4W
R065	RN14BK2H1004F	RES. METAL FILM	1M	1%	1/2W
R066	RD14BY2H104J	RES. CARBON	100K	5%	1/2W
R067	RD14CB2E101J	RES. CARBON	100	5%	1/4W
R068	RD14BB2E223J	RES. CARBON	22K	5%	1/4W
R069	RD14BB2E223J	RES. CARBON	22K	5%	1/4W
R070	RD14CB2E561J	RES. CARBON	560	5%	1/4W
R071	RD14BB2E332J	RES. CARBON	3.3K	5%	1/4W
R072	RD14CB2E392J	RES. CARBON	3.9K	5%	1/4W
R073	RD14CB2E470J	RES. CARBON	47	5%	1/4W
R074	RD14CB2E470J	RES. CARBON	47	5%	1/4W
R075	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R076	RN14BK2E3601G	RES. METAL FILM	3.6K	2%	1/4W
R077	RD14BB2E331J	RES. CARBON	330	5%	1/4W
R078	RN14BK2E8200F	RES. METAL FILM	820	1%	1/4W
R079	RN14BK2E3300F	RES. METAL FILM	330	1%	1/4W
R080	RD14BB2E220J	RES. CARBON	22	5%	1/4W
R081	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R082	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R083	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R084	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R085	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R086	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R087	RD14BB2E333J	RES. CARBON	33K	5%	1/4W
R088	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R089	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R090	RN14BK2E3001F	RES. METAL FILM	3K	1%	1/4W
R091	RN14BK2E3001F	RES. METAL FILM	3K	1%	1/4W
R092	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R093	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R094	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R095	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R096	RD14BB2E471J	RES. CARBON	470	5%	1/4W
R097	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R098	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R099	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R100	RD14BB2E332J	RES. CARBON	3.3K	5%	1/4W
R101	RD14BB2E561J	RES. CARBON	560	5%	1/4W
R102	RD14BB2E152J	RES. CARBON	1.5K	5%	1/4W
R103	RD14CB2E101J	RES. CARBON	100	5%	1/4W
R104	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R105	RN14BK2E1800F	RES. METAL FILM	180	1%	1/4W
R106	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R107	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R111	RD14BB2E560J	RES. CARBON	56	5%	1/4W
R112	RD14BB2E560J	RES. CARBON	56	5%	1/4W
R113	RD14BB2E220J	RES. CARBON	22	5%	1/4W
R114	RD14BB2E220J	RES. CARBON	22	5%	1/4W
R115	RD14BB2E2R2J	RES. CARBON	2.2	5%	1/4W
R116	RD14BB2E2R2J	RES. CARBON	2.2	5%	1/4W
R117	RD14BB2E104J	RES. CARBON	100K	5%	1/4W

REF.NO	PARTS NO	NAME & DESCRIPTION			
R118	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R119	RN14BK2E1502F	RES. METAL FILM	15K	1%	1/4W
R120	RN14BK2E1502F	RES. METAL FILM	15K	1%	1/4W
R121	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R122	RD14BB2E152J	RES. CARBON	1.5K	5%	1/4W
R123	RD14BB2E2R2J	RES. CARBON	2.2	5%	1/4W
R124	RN14BK2H2703F	RES. METAL FILM	270K	1%	1/2W
R125	RN14BK2E1502F	RES. METAL FILM	15K	1%	1/4W
R126	RN14BK2E7501F	RES. METAL FILM	7.5K	1%	1/4W
R127	RN14BK2E1502F	RES. METAL FILM	15K	1%	1/4W
R128	NO USE				
R129	RD14BB2E472J	RES. CARBON	4.7K	5%	1/4W
R130	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R131	RD14BB2E100J	RES. CARBON	10	5%	1/4W
R132	RD14BB2E473J	RES. CARBON	47K	5%	1/4W
R133	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R134	RD14BB2E472J	RES. CARBON	4.7K	5%	1/4W
R135	RD14BB2E393J	RES. CARBON	39K	5%	1/4W
R136	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R137	RD14BB2E471J	RES. CARBON	470	5%	1/4W
R138	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R139	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R140	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R141	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R142	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R143	RC05GF2H105J	RES. SOLID	1M	5%	1/2W
R144	RC05GF2H226K	RES. SOLID	22M	10%	1/2W
R145	RC05GF2H226K	RES. SOLID	22M	10%	1/2W
R146	RC05GF2H473J	RES. SOLID	47K	5%	1/2W
R147	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R148	RD14BB2E682J	RES. CARBON	6.8K	5%	1/4W
R149	RD14BB2E472J	RES. CARBON	4.7K	5%	1/4W
R150	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R151	RD14BB2E473J	RES. CARBON	47K	5%	1/4W
R152	R92-0707-05	RES. FIXED			
R153	RD14BB2E124J	RES. CARBON	120K	5%	1/4W
R154	RD14BB2E224J	RES. CARBON	220K	5%	1/4W
R155	RD14BB2E181J	RES. CARBON	180	5%	1/4W
R156	NO USE				
R157	RD14BB2E822J	RES. CARBON	8.2K	5%	1/4W
R161	RD14BB2E223J	RES. CARBON	22K	5%	1/4W
R162	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R163	RD14BB2E333J	RES. CARBON	33K	5%	1/4W
R168	RD14BB2E681J	RES. CARBON	680	5%	1/4W

S001	S32-4007-05	SLIDE SWITCH	
S002	S03-4501-05	ROTARY SWITCH	
S003	S32-4007-05	SLIDE SWITCH	
S004	S03-4501-05	ROTARY SWITCH	
T001	L19-0019-05	CONVERTOR TRANSFORMER	
TC001	C05-0403-05	CAP. TRIMMER	2P
TC002	C05-0403-05	CAP. TRIMMER	2P
TC005	C05-0405-05	CAP. TRIMMER	20P
TC006	C05-0403-05	CAP. TRIMMER	2P
TC007	C05-0403-05	CAP. TRIMMER	2P
TC010	C05-0405-05	CAP. TRIMMER	20P
TC011	C05-0405-05	CAP. TRIMMER	20P
TC012	C05-0405-05	CAP. TRIMMER	20P
TP001	E23-0508-04	TEST TERMINAL	
TP002	E23-0508-04	TEST TERMINAL	
VR001	R12-0509-05	RES. SEMI FIXED	220 B
VR002	R01-0503-05	V.R.	500 B
VR003	R12-0509-05	RES. SEMI FIXED	220 B
VR004	R12-0509-05	RES. SEMI FIXED	220 B
VR005	R01-1013-25	V.R.	1K B
VR006	R12-0510-05	RES. SEMI FIXED	680 B
VR007	R12-1002-05	RES. SEMI FIXED	1K B
VR008	R12-1004-05	RES. SEMI FIXED	4.7K B
VR011	R12-0509-05	RES. SEMI FIXED	220 B
VR012	R01-0503-05	V.R.	500 B
VR013	R12-0509-05	RES. SEMI FIXED	220 B
VR014	R12-0509-05	RES. SEMI FIXED	220 B
VR015	R01-1013-25	V.R.	1K B
VR016	R12-1002-05	RES. SEMI FIXED	1K B
VR017	R12-1002-05	RES. SEMI FIXED	1K B
VR018	R12-1004-05	RES. SEMI FIXED	4.7K B
VR021	R12-3004-05	RES. SEMI FIXED	47K B
VR022	R12-6005-05	RES. SEMI FIXED	330K B
VR023	R12-3004-05	RES. SEMI FIXED	47K B
VR024	R12-1003-05	RES. SEMI FIXED	2.2K B

PARTS LIST

X74-1110-02

REF.NO	PARTS NO	NAME & DESCRIPTION			
	E33-4066-00	WIRE ASSY			
	J25-2828-23	PCB (UNMOUNTED)			
	R92-0150-05	JUMPING RES.	ZERO OHM		
C001	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C002	CE04BW1H010M	CAP. ELECTRO	1	20%	50V
C003	CE04BW1H4R7M	CAP. ELECTRO	4.7	20%	50V
C004	CE04BW1H010M	CAP. ELECTRO	1	20%	50V
C005	NO USE				
C006	CE04BW1H010M	CAP. ELECTRO	1	20%	50V
C007	NO USE				
C008	CE04W1A101	CAP. ELECTRO	100		10V
C009	CE04BW1H010M	CAP. ELECTRO	1	20%	50V
C010	CE04BW1H010M	CAP. ELECTRO	1	20%	50V
C011	CE04BW1H010M	CAP. ELECTRO	1	20%	50V
C012	CE04BW1H010M	CAP. ELECTRO	1	20%	50V
C013	CC45CH1H330J	CAP. CERAMIC	33P	5%	50V
C014	CC45CH1H330J	CAP. CERAMIC	33P	5%	50V
C015	CQ93M1H472K	CAP. MYLAR	4700P	10%	50V
C016	CQ93M1H472K	CAP. MYLAR	4700P	10%	50V
C017	CC45SL1H151J	CAP. CERAMIC	150P	5%	50V
C018	CK45B1H332K	CAP. CERAMIC	3300P	10%	50V
C019	CC45CH1H680J	CAP. CERAMIC	68P	5%	50V
C020	CK45B1H391K	CAP. CERAMIC	390P	10%	50V
C021	CQ93BP2A472F	CAP. MYLAR	4700P	1%	100V
C022	CM93BD2A330J	CAP. MICA	33P	5%	100V
C023	CC45SL1HZ20J	CAP. CERAMIC	22P	5%	50V
C024	CE04W1E100	CAP. ELECTRO	10		25V
C025	CE04W1E100	CAP. ELECTRO	10		25V
C026	CE04W1C101	CAP. ELECTRO	100		16V
C027	CK45B1H102K	CAP. CERAMIC	1000P	10%	50V
C028	CE04W1A101	CAP. ELECTRO	100		10V
C029	CE04W1A101	CAP. ELECTRO	100		10V
C030	CC45SL1H100D	CAP. CERAMIC	10P	0.5P	50V
C031	CC45CH1H050C	CAP. CERAMIC	5P	0.25P	50V
C032	CE04W2E3R3	CAP. ELECTRO	3.3		250V
C033	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C034	CE04W1A101	CAP. ELECTRO	100		10V
C035	CE04W1C101	CAP. ELECTRO	100		16V
C036	CE04W1A101	CAP. ELECTRO	100		10V
C037	CE04W1C330	CAP. ELECTRO	33		16V
C038	NO USE				
C039	CE04W1A101	CAP. ELECTRO	100		10V
C045	C093M1H104K	CAP. MYLAR	0.1	10%	50V
C048	CC45SL1H151J	CAP. CERAMIC	150P	5%	50V
C049	CE04BW1H010M	CAP. ELECTRO	1	20%	50V
C050	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
D001	1S1555	DIODE			
D002	1S1555	DIODE			
D003	1S1555	DIODE			
D004	1S1555	DIODE			
D005	1S1555	DIODE			
D006	1S1555	DIODE			
D007	1S1555	DIODE			
D008	1S1555	DIODE			
D009	1S1555	DIODE			
D010	1S1555	DIODE			
D011	1S1555	DIODE			
D012	1S1555	DIODE			
D013	1S1555	DIODE			
D014	1S1555	DIODE			
D015	1S1555	DIODE			
D016	1S1555	DIODE			
D017	1S1555	DIODE			
D018	1S1555	DIODE			
D019	1S1555	DIODE			
D020	1S1555	DIODE			
D021	1N60	DIODE			
D022	1S1555	DIODE			
D023	1S1555	DIODE			
D024	1S1555	DIODE			
D029	1N60	DIODE			
D030	1S1555	DIODE			
D031	1S1555	DIODE			
D032	1S1555	DIODE			
IC001	SN7400N	IC			
IC002	SN7400N	IC			
IC003	SN7400N	IC			
IC004	SN7400N	IC			
IC005	SN7400N	IC			
IC006	SN7472N	IC			
IC007	SN7472N	IC			
J001	E40-0906-05	PIN CONNECTOR	9 P		
L005	L40-1511-03	FERRI INDUCTOR	150UH		
L006	L40-2711-03	FERRI INDUCTOR	270UH		
L006	L40-4711-03	FERRI INDUCTOR	470UH		

REF.NO	PARTS NO	NAME & DESCRIPTION			
P001	E23-0047-04	TERMINAL			
P002	E23-0047-04	TERMINAL			
P003	E23-0047-04	TERMINAL			
P004	E40-0903-05	PIN CONNECTOR	9 P		
P005	E40-0603-05	PIN CONNECTOR	6 P		
P006	E40-0403-05	PIN CONNECTOR	4 P		
P007	E40-0403-05	PIN CONNECTOR	4 P		
Q001	2SA733(Q)	TR. SI, PNP			
Q002	2SC945(P)	TR. SI, NPN			
Q003	2SC945(P)	TR. SI, NPN			
Q004	2SC945(P)	TR. SI, NPN			
Q005	2SC945(P)	TR. SI, NPN			
Q006	2SC945(P)	TR. SI, NPN			
Q007	2SC945(P)	TR. SI, NPN			
Q008	2SC945(P)	TR. SI, NPN			
Q009	2SC945(P)	TR. SI, NPN			
Q010	2SK30A(O)	FET,N-CHANNEL			
Q011	2SC945(P)	TR. SI, NPN			
Q012	2SC945(P)	TR. SI, NPN			
Q013	2SC945(P)	TR. SI, NPN			
Q014	2SC945(P)	TR. SI, NPN			
Q015	2SC945(P)	TR. SI, NPN			
Q016	2SC945(P)	TR. SI, NPN			
Q017	2SC945(P)	TR. SI, NPN			
Q018	2SC945(P)	TR. SI, NPN			
Q019	2SC2068	TR. SI, NPN			
Q020	2SC2068	TR. SI, NPN			
Q021	2SA733(Q)	TR. SI, PNP			
Q022	2SA733(Q)	TR. SI, PNP			
R001	RN14BK2E3000F	RES. METAL FILM	300	1%	1/4W
R002	RN14BK2E2201F	RES. METAL FILM	2.2K	1%	1/4W
R003	RD14BB2E152J	RES. CARBON	1.5K	5%	1/4W
R004	RD14BB2E681J	RES. CARBON	680	5%	1/4W
R005	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R006	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R007	RD14BB2E821J	RES. CARBON	820	5%	1/4W
R008	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R009	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R010	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R014	RD14BB2E821J	RES. CARBON	820	5%	1/4W
R015	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R016	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R017	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R018	RD14CB2E684J	RES. CARBON	680K	5%	1/4W
R019	RD14CB2E105J	RES. CARBON	1M	5%	1/4W
R020	RD14CB2E222J	RES. CARBON	2.2K	5%	1/4W
R021	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R022	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R023	RD14BB2E202J	RES. CARBON	2K	5%	1/4W
R024	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R025	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R026	RD14BB2E561J	RES. CARBON	560	5%	1/4W
R027	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R028	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R029	RD14BB2E202J	RES. CARBON	2K	5%	1/4W
R030	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R031	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R032	RD14BB2E561J	RES. CARBON	560	5%	1/4W
R033	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R034	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R035	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R036	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R037	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R038	RD14CB2E102J	RES. CARBON	1K	5%	1/4W
R039	RD14CB2E102J	RES. CARBON	1K	5%	1/4W
R040	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R041	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R042	RD14BB2E105J	RES. CARBON	1M	5%	1/4W
R043	RD14BB2E472J	RES. CARBON	4.7K	5%	1/4W
R044	RN14BK2H7503F	RES. METAL FILM	750K	1%	1/2W
R045	RN14BK2E1503F	RES. METAL FILM	150K	1%	1/4W
R046	RN14BK2E4992F	RES. METAL FILM	49.9K	1%	1/4W
R047	RN14BK2E9100F	RES. METAL FILM	910	1%	1/4W
R048	NO USE				
R049	RD14BB2E153J	RES. CARBON	15K	5%	1/4W
R050	RS14GB3D393J	RES. METAL FILM	39K	5%	2W
R051	RN14BK2E1801F	RES. METAL FILM	1.8K	1%	1/4W
R052	RN14BK2E3001F	RES. METAL FILM	3K	1%	1/4W
R053	RD14BB2E183J	RES. CARBON	18K	5%	1/4W
R054	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R055	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R056	RD14BB2E472J	RES. CARBON	4.7K	5%	1/4W
R057	RD14BB2E332J	RES. CARBON	3.3K	5%	1/4W
R058	RD14BB2E272J	RES. CARBON	2.7K	5%	1/4W
R059	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R060	RD14BB2E332J	RES. CARBON	3.3K	5%	1/4W
R061	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R062	RD14BB2E561J	RES. CARBON	560	5%	1/4W
R063	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R064	RD14BB2E220J	RES. CARBON	22	5%	1/4W
R065	RD14BB2E220J	RES. CARBON	22	5%	1/4W
R066	RN14BK2E3001F	RES. METAL FILM	3K	1%	1/4W
R067	RN14BK2E3001F	RES. METAL FILM	3K	1%	1/4W
R068	RN14BK2E3000F	RES. METAL FILM	300	1%	1/4W

PARTS LIST

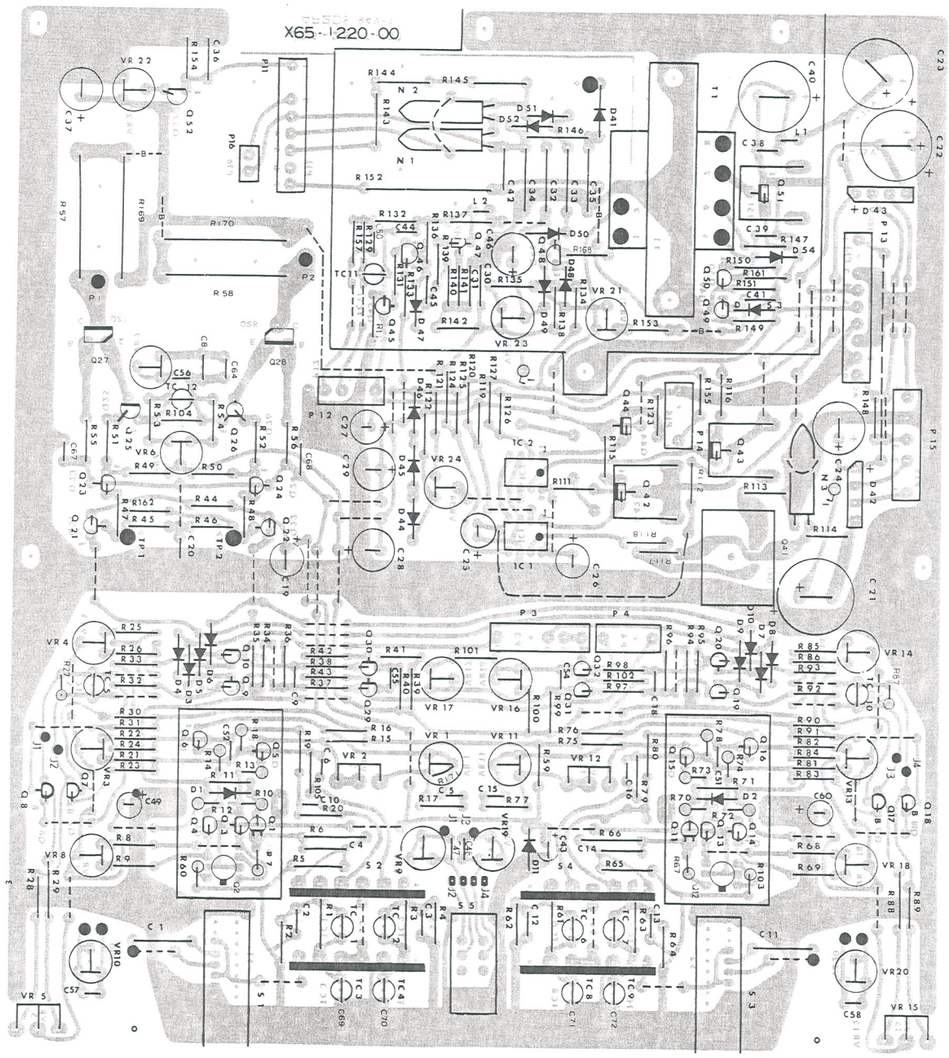
REF.NO	PARTS NO	NAME & DESCRIPTION			
R069	RD14BB2E391J	RES. CARBON	390	5%	1/4W
R070	RS14GB3F183J	RES. METAL FILM	18K	5%	3W
R071	RS14GB3F183J	RES. METAL FILM	18K	5%	3W
R072	RD14CB2E101J	RES. CARBON	100	5%	1/4W
R073	RN14BK2E4992F	RES. METAL FILM	49.9K	1%	1/4W
R074	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R075	NO USE				
R076	RD14BB2E332J	RES. CARBON	3.3K	5%	1/4W
R077	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R080	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R081	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R082	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R083	RD14CB2E332J	RES. CARBON	3.3K	5%	1/4W
R084	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R085	RD14BB2E682J	RES. CARBON	6.8K	5%	1/4W
R086	RD14CB2E101J	RES. CARBON	100	5%	1/4W
R087	RD14CB2E102J	RES. CARBON	1K	5%	1/4W
R088	RD14CB2E682J	RES. CARBON	6.8K	5%	1/4W
R089	RD14BB2E562J	RES. CARBON	5.6K	5%	1/4W
R090	RD14BB2E682J	RES. CARBON	6.8K	5%	1/4W
R091	RD14BB2E562J	RES. CARBON	5.6K	5%	1/4W
R092	RD14CB2E241J	RES. CARBON	240	5%	1/4W
S001	S33-2501-05	LEVER SWITCH			
S002	S33-2501-05	LEVER SWITCH			
S003	S03-2501-15	ROTARY SWITCH			
TC001	C05-0405-05	CAP. TRIMMER	20P		
VR001	R01-2503-05	V.R.	10K B		
VR002	R01-2501-05	V.R.	5K B		
VR003	NO USE				
VR004	R12-3002-05	RES. SEMI FIXED	10K B		
VR005	R12-1003-05	RES. SEMI FIXED	2.2K B		

X77-1020-00

REF.NO	PARTS NO	NAME & DESCRIPTION
	E08-1081-05	VOLTAGE SELECTOR RECEPTACLE
	E09-0681-05	VOLTAGE SELECTOR PLUG
	E23-0047-04	TERMINAL
	E40-0233-05	PIN CONNECTOR 2P
	E40-0533-05	PIN CONNECTOR
	E40-0635-05	PIN CONNECTOR
	F19-0703-04	VOLTAGE SECECTOR PLATE
	J12-0501-14	MOLDED PIN
	J25-2805-14	PCB (UNMOUNTED)

P.C. BOARD

X65-1220-02



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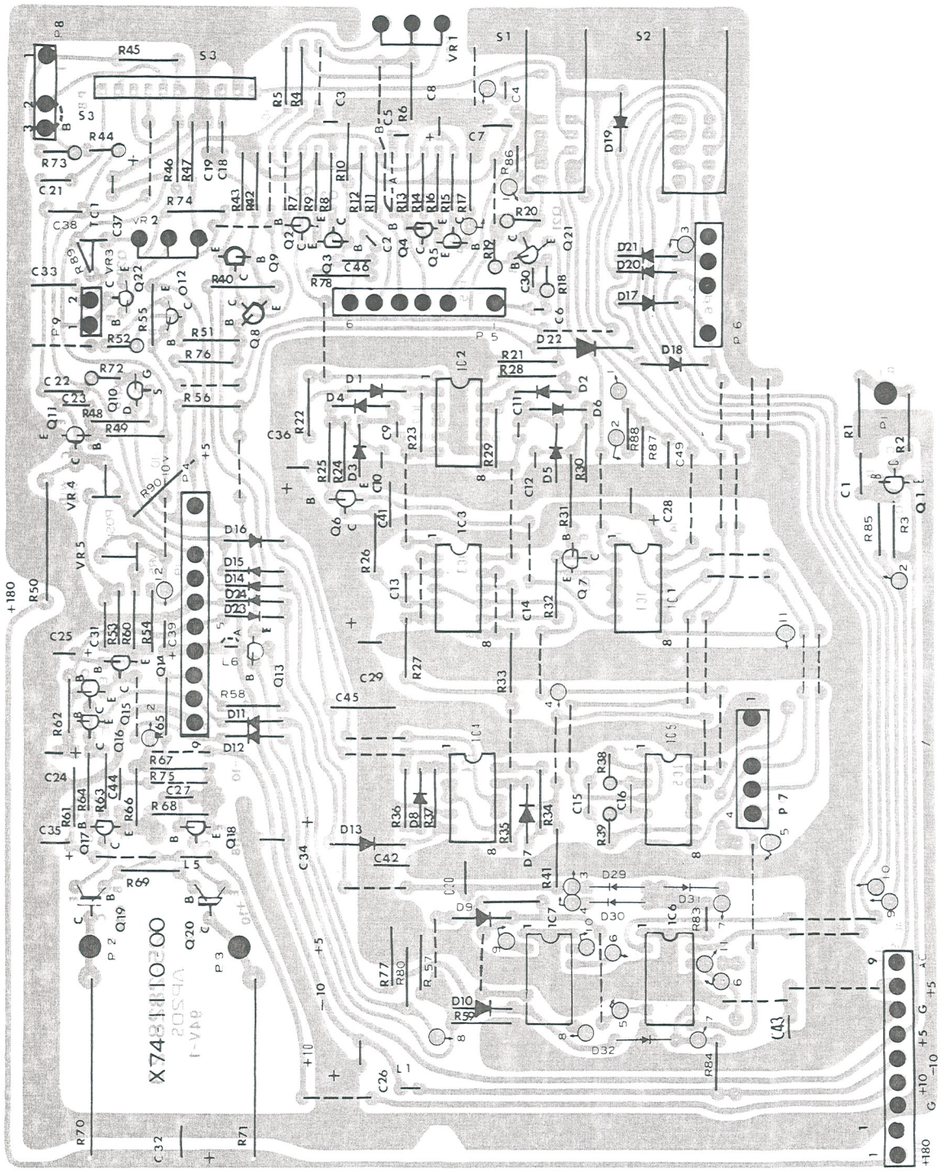

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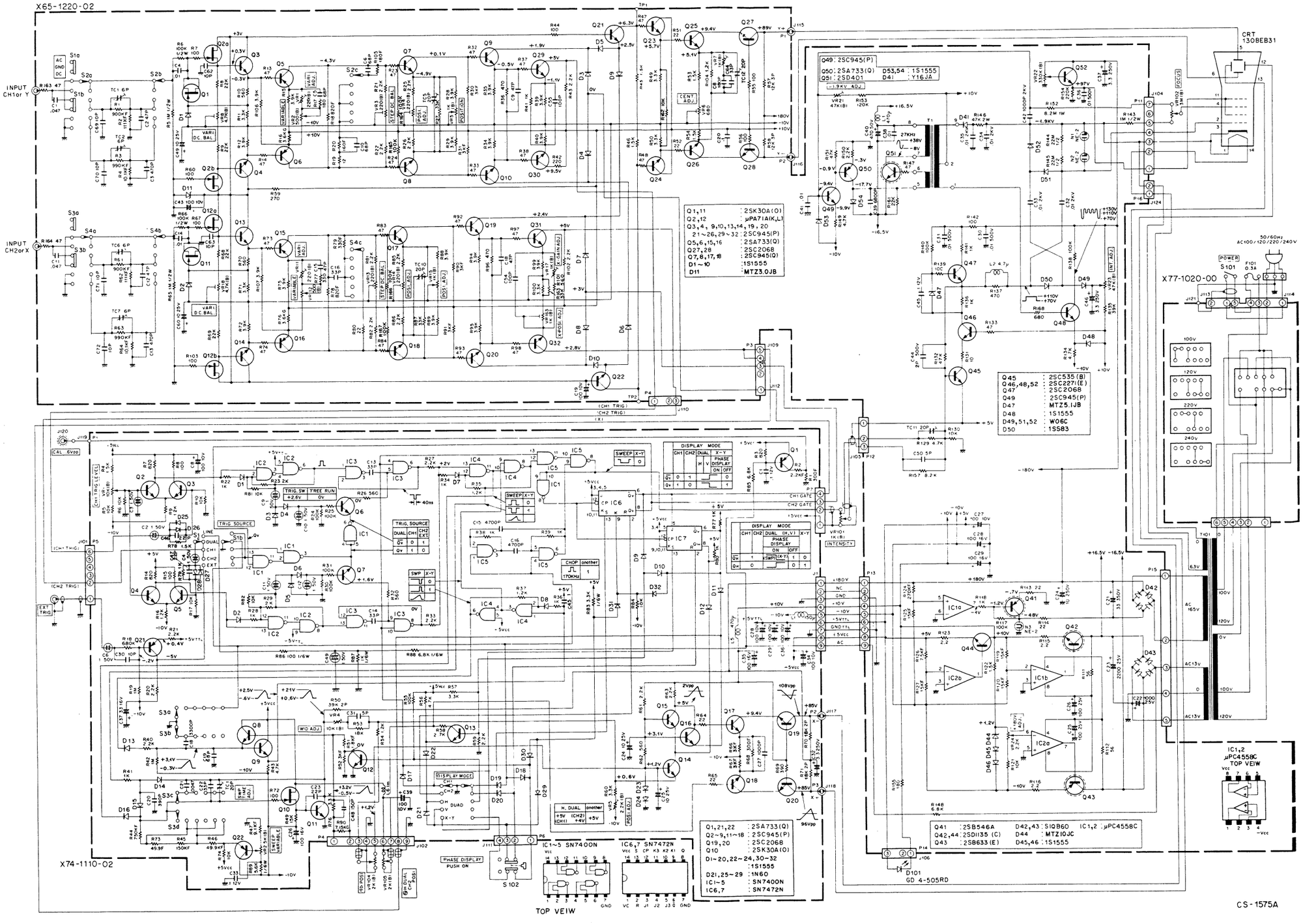

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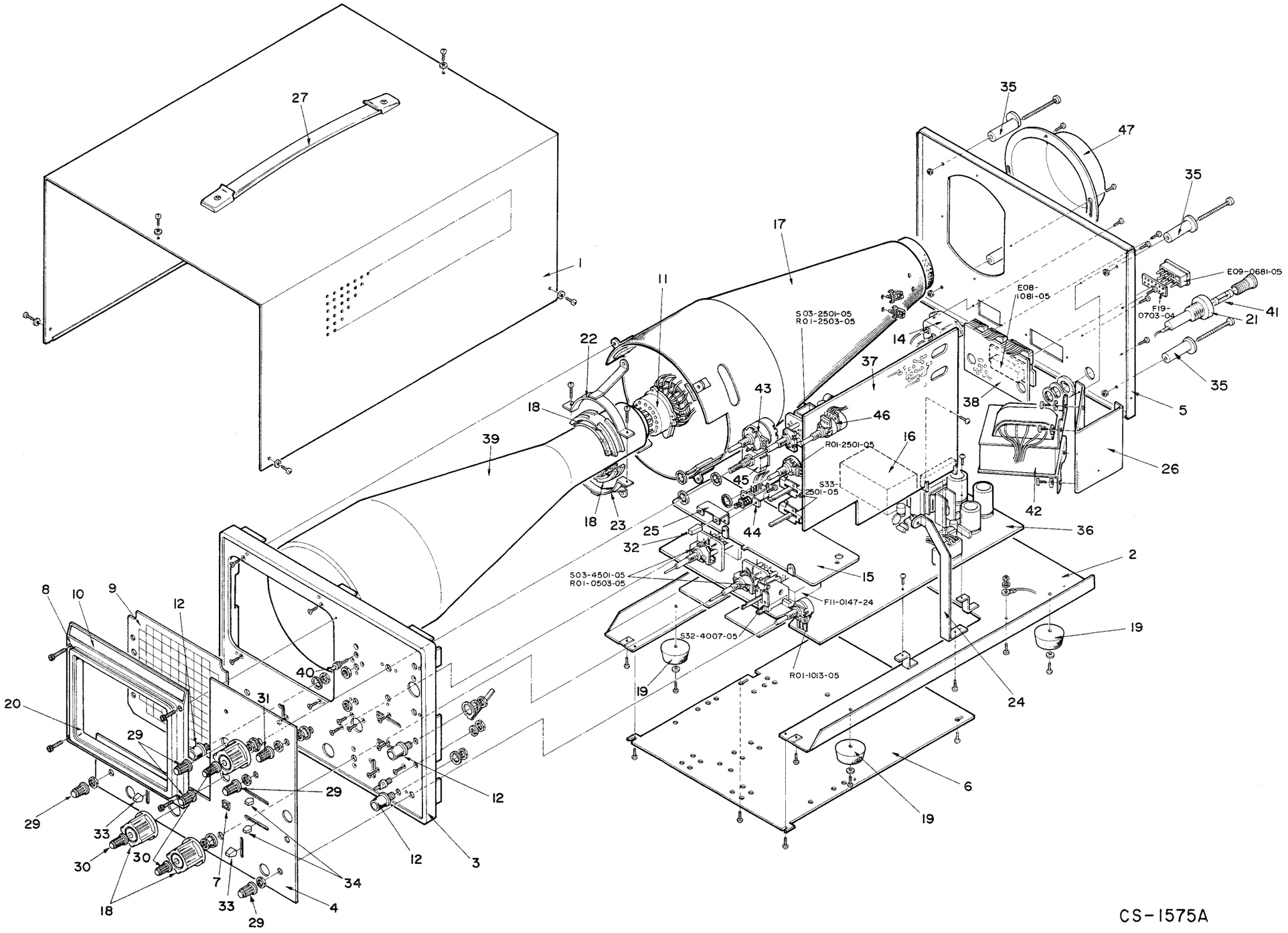
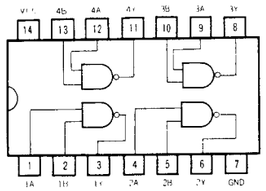


CS-1575A

SEMICONDUCTORS

TTL IC



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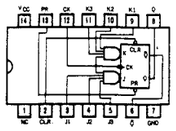

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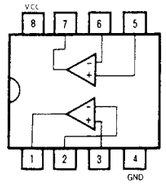
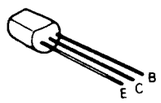


μPC4558C

TRANSISTOR



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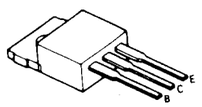

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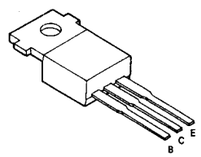

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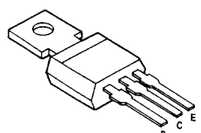

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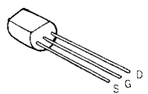

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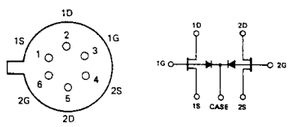

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